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HEARING

BEFORE THE

UBCOMMITTEE ON RISK MANAGEMENT, RESEARCH, AND SPECIALTY CROPS

OF THE

COMMITTEE ON AGRICULTURE
HOUSE OF REPRESENTATIVES

ONE HUNDRED SIXTH CONGRESS

FIRST SESSION

ON

H.R. 2827

OCTOBER 19, 1999

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[1] Deceased July 16, 1999.

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THE NATIONAL SUSTAINABLE FUELS AND CHEMICALS ACT OF 1999 AND BIOMASS RESEARCH

TUESDAY, OCTOBER 19, 1999

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON RISK MANAGEMENT,
RESEARCH, AND SPECIALTY CROPS,
COMMITTEE ON AGRICULTURE,
Washington, DC.

The subcommittee met, pursuant to call, at 10:12 a.m. in room 1300, Longworth House Office Building, Hon. Thomas W. Ewing (chairman of the subcommittee) presiding.

Present: Representatives Barrett, Smith, LaHood, Gutknecht, Ose, Hayes, Condit, Pomeroy, Baldacci, Goode, Etheridge, Boswell, Lucas of Kentucky, and Stenholm [ex officio].

Also present: Representative Minge.

Staff present: John Goldberg, professional staff; Ryan Weston, subcommittee staff director; Christy Cromley, legislative assistant; Wanda Worsham, chief clerk; Callista Bisek, scheduler/clerk, Anne Simmons, minority consultant.

OPENING STATEMENT OF HON. THOMAS W. EWING, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF ILLINOIS

Mr. EWING. The hearing of the Subcommittee on Risk Management, Research, and Specialty Crops to review H.R. 2827, the National Sustainable Fuels and Chemicals Act of 1999, and biomass research, shall come to order.

I want to welcome you to this morning's hearing to review H.R. 2827, The National Sustainable Fuels and Chemicals Act of 1999. I would like to thank our witnesses for taking time to appear before our subcommittee on this important piece of legislation.

While the title of this legislation may lead you to believe that this topic can be extremely technical in nature, the goal of this legislation is simple: to authorize research that will allow the coproduction of food and chemicals from a single plant and to find ways to use an entire plant more efficiently in the production of biobased products.

People may wonder why this legislation is critical to the United States. With the world population expected to grow from today's current 6 billion people to an estimated 10 billion people in the next 55 years, simply providing the amount of food and fuel needed to live at today's standards will be a daunting challenge in the years to come.

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U.S. citizens enjoy the benefit of automobile transportation, largely dependent upon oil transports. The recent increase in gasoline prices at the pumps have made it all too clear just how dependent we are on imported oil.

U.S. farmers have long been the envy of the world regarding their efficiency and production levels. While current farm gate prices are extremely low, finding other sources of income for U.S. farmers may be the perfect way to help increase their net farm incomes.

I would like to give you a brief overview of H.R. 2827 to discuss how this bill can help with increasing U.S. biobased fuel production and increasing farm income at the same time.

Biomass products, including biobased fuels, can be derived from corn or any type of plant, tree, or organic agricultural waste, such as rice hulls and sugarcane stalks. The bill creates a sustainable fuel and chemical research initiative to award competitive grants, contracts, and other financial assistance to research entities, and it would authorize $49 million a year, from 2000 to 2005 to fund the initiative.

The legislation would further establish a Sustainable Fuel and Chemical Board to coordinate the programs. The Sustainable Fuel and Chemical Board would consist of high-level officials from the Departments of Agriculture, Energy, and Interior; the Environmental Protection Agency; the National Science Foundation; and the Office of Science and Technology.

The legislation also establishes a Sustainable Fuel and Chemical Technical Advisory Committee, which is comprised of seven members who have expertise in biobased products.

These professionals will provide guidance to the Board in determining how to award the grant and research money authorized in the bill. New research created by this legislation will help to provide in the expedited development of alternative fuels that are environmentally friendly. Problems with alternative fuels such as MTBE have proven the need for more environmentally-friendly alternative fuels, such as ethanol.

The bill will also authorize the appropriation of $14 million to the U.S. Department of Agriculture in 2000 to construct a pilot plant for corn-based ethanol research. This pilot plant and further research authorized in this bill will assist in providing the information on the benefits of ethanol to the Federal Reformulated Gasoline Program.

H.R. 2827 is needed to ensure that this committee meets its responsibilities to authorize and encourage research for competitive energy sources such as those which may be developed from continued biomass research.

My bill is a companion bill to legislation that Senator Lugar has introduced, Senate bill 935. These two pieces of legislation build upon an idea expressed in a White House Executive Order released in August of this year. Both Senator Lugar and I understand how much each and every research dollar is valued. Because this is such important research, not only for agriculture producers, but also for those interested in protecting the environment and creating a sustainable energy supply, we need to push forward with this legislation. We cannot afford to let other countries be the first to de-

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velop and monopolize new technologies, since it may lead to our future dependence on imported energy sources.

It will take an organized effort in these emerging technology sciences to engage their development and growth.

We will also hear from one of our colleagues on the Science Committee, who has introduced similar legislation, which further proves the need and interest for more research in this area.

I look forward to today's testimony and am eager to hear about the new and exciting biomass opportunities which may be discovered in the near future.

If any other Members have opening statements, I would encourage them to submit them for the record.

PREPARED STATEMENT OF HON. BILL BARRETT, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEBRASKA

Thank you, Mr. Chairman for holding this very important hearing to discuss H.R. 2827, the National Sustainable Fuels and Chemicals Act of 1999. This bill is very important as we continue to address the many concerns regarding the future of biotechnology.

As you know, this bill would establish a research initiative into the variable uses of bioengineered commodities. Our farmers are experiencing a tough time when it comes to marketing and establishing a market for their crops. Also, biotechnology is one of the most important issues as agriculture moves into the next century.

This legislation would move bioenergy/biomass industry together for a joint research initiative that could prove to be very beneficial in the near future. By combining the two industries the research that is derived will lead to better coordination and improved innovation.

The results of this research will lead to new markets in the agriculture economy, as well as broadening the existing markets. It appears that corn and soybeans will benefit the most through ethanol and biodiesel. With the current excess supply of soybeans, biodiesel could become a valuable market to soybean farmers in the Midwest.

The future of biotechnology is on every soybean and corn farmer's mind as he prepares for the upcoming planting season. It seems like only last year that genetically modified seeds were introduced as a move into the future of agriculture. Producers in Nebraska have used the genetically modified seed in the past and have expressed the numerous benefits of planting genetically modified seed as opposed to conventional seed. It has allowed farmers to control their crops while lowering the number of chemical applications.

The research that this bill will provide could open markets that we never thought were possible in the agriculture industry. Through this committee, I will continue to express the importance of biotechnology to the future of agriculture. I believe the research that has been conducted regarding biotechnology is very important to the future of our Nation's farmers.

Again, I would like to thank the chairman for holding this very important hearing. I look forward to hearing testimony from our distinguished panel of witnesses.

PREPARED STATEMENT OF HON. GARY A. CONDIT, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF CALIFORNIA

Mr. Chairman, thank you for having this important and educational hearing. I cannot think of a better time for this subcommittee to address the potential value of renewable resources as the world approaches a new millennium with a rapidly growing population. This means that we have to get more creative in using materials often considered "excess" or "waste," while being environmentally and economically sound.

California has unique traits that make it a viable candidate for using biobased products: high pollution, densely-populated cities, limited water, and one of the most diverse and productive agricultural areas in the world. Not only does California have the need for biomass research, but it also has an abundant biomass supply.

Energy produced in California accounts for more than 30 percent of the Nation's biomass-generated electricity—far more than any other State. Wood wastes, rice straw, and specialty crop residues are all used to produce energy. This provides a valuable use for pits from peaches, prunes, and olives and shells from walnuts and almonds. Otherwise, these wastes would be burned in open fields or dumped into

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landfills. By reducing smoke and methane emissions, we help improve air quality of the Central Valley. Other benefits include increased employment opportunities in a high unemployment area, more tax revenue to rural communities, and a decreased risk of wildfires.

Other efforts being undertaken in California include the conversion of rice fiber into low cost fiberboard to replace wood, insulation, and drywall materials. Rice straw may also be converted into ethanol and citric acid. These uses reduce the amount of rice straw currently being burned after harvest.

The University of California system is also involved, creating and evaluating new technologies to promote emission reduction and energy efficiency in transportation and manufacturing processes. This includes production of methanol, as opposed to ethanol, from renewable resources to use as a primary fuel, fuel additive, or hydrogen energy source. Researchers are also developing economical and viable uses for animal waste, which is sorely needed by the entire sector of animal agriculture. This is especially important to the dairy and poultry producers in my district.

Mr. Chairman, I commend you for your bill, H.R. 2827, the National Sustainable Fuels and Chemicals Act of 1999. The coordination of research and application efforts among public and private entities is vital in furthering the opportunities to use such unconventional resources.

While I have no doubt scientists can create bioenergy and other bioproducts, I do recognize the economic and logistic challenges of applying these discoveries to real world uses. Farmers must want to supply biomass, industry must want to use biomass, and consumers must want to buy biobased products. Through proper regulation and oversight, Congress can assist in making this transition easier. I look forward to hearing input from the panel discussions today.

PREPARED STATEMENT OF HON. DEBBIE STABENOW, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF MICHIGAN

Mr. Chairman, thank you for bringing the subcommittee today to review the important issue of biomass research. I appreciate the opportunity to consider the legislation before us, H.R. 2827, the National Sustainable Fuels and Chemicals Act of 1999.

As we all know, biomass research is a critical issue for the 21st century. Not only will biomass research open new markets for agricultural commodities and byproducts, but it holds the promise of improving our global environment and our Nation's energy security. Earlier this year, I was pleased to participate in a event on the National Mall as the Argo research team completed a cross-country drive in a truck that used biobased lubricants. The composition of the lubricant was 100 percent biobased materials, a good majority of which were derived from soybeans. Michigan soybean producers have formed a partnership with Argo and are working to develop a marketable product. I am proud that a fleet of postal vehicles in Michigan have already contracted with Argo to use the lubricant. I am encouraged by this progress and strongly support the continued development of biobased products.

I am pleased with the legislation that is before us today. It is critical that the research efforts at USDA and DOE are integrated so we can maximize our results in this important field. The Sustainable Fuels and Chemical Research Initiative is what this nation needs to direct biobased research.

Mr. EWING. Yes, Mr. Minge?

Mr. MINGE. Mr. Chairman, I'd simply like to thank you for holding this hearing today.

I, along with colleagues, are co-chairs of the Sustainable Fuel Coalition here in the House of Representatives, and we very much appreciate both your interest in this legislation and your commitment to this cause.

And I'd like to also note that one of our colleagues, Mark Udall, is here, and I look forward to your remarks.

And, finally, I'd like to acknowledge the presence of the chairman of the American Soybean Association from Murdock, MN in my district as a witness on behalf of that association, and thank him for coming out from Minnesota in the midst of a busy harvest season.

Thank you.

Mr. EWING. Thank you very much.

Due to time constraints, we will operate under the 5-minute rule.

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The Chair will ask that witnesses help meet our time constraints by summarizing oral testimony as quickly as possible. We would like to give the Members adequate opportunity for questions. Your entire written statement will be included in the record.

The Chair would also like to ask witnesses to remain available throughout the hearing to comment on issues that may arise later in our proceedings.

The committee would call its first panel to the table, The Honorable Mark Udall, representative of the second district of Colorado.

Welcome. We are interested in hearing about your bill.

STATEMENT OF HON. MARK UDALL, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF COLORADO

Mr. UDALL. Thank you, Mr. Chairman. I want to thank you for holding this hearing on a very important topic.

As I begin, I should note that, although I'd like to stay and hear the totality of all the testimony, I am expected at a Resources Committee hearing with Secretary Babbitt and will have to leave after I deliver my comments.

As your subcommittee considers biomass legislation, I appreciate the opportunity you have extended to me to bring to your attention bill H.R. 2819, the Biomass Research and Development Act of 1999, which was introduced on the 8th of September of this year by Congressman Boehlert, Congressman Minge, who is here today, and me. We worked for a number of months with the administration and Senator Lugar's staff to develop a bill that builds on the Senate measure.

The good news is that both of our bills have much in common. Both recognize the increased contribution that biobased industrial products can make to our economy if an appropriate research program is put in place.

We have barely scratched the possibilities to date. Chemicals, lubricants, adhesives, plastics, and pharmaceuticals are all key areas where research and development can lead to new products, new industrial development, and new jobs.

Both of our bills have similar structures, including cooperation between the Departments of Energy and Agriculture, other interagency coordination, and the solicitation of the views of outside experts to developing priorities.

Our bill, I should add, does go beyond H.R. 2827 in a number of areas, such as peer review of research, study of the effects of increased bioproduction on the environment, and study of the economics of bioenergy and biobased industrial products.

We have somewhat different ideas on definitions and on the makeup of the Advisory Committee. There is also a difference regarding how much specificity should be in the bill and to what degree research priorities should be established by outside experts. Still, there are more similarities than differences in our two approaches. I hope we will be able to combine our efforts somewhere in the legislative process and send to the Senate and to the President a bill that contains the best ideas from both our efforts.

Your bill specifies several important research focuses for the program, such as cellulosic conversion.

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We had talked earlier, Mr. Chairman. This is particularly important in Colorado, because, along our front range, where most of the people in Colorado live, there is a close geographical proximity of national forests and major population centers, and there are a total of about 370,000 homes and 750,000 people in areas that are potentially threatened by wildfires. To reduce and control these risks, there is a need to thin the fuel buildup, but there is currently no effective use or market for much of this material.

Of course, to do that, we need to proceed carefully and keep in balance with our forest management, but I think there is great value in exploring the development of ethanol from wood fiber and the creation of other new bioproducts from these wastes.

The other research priorities in your bill that your bill lists are important, even central, to today's biomass R&D needs; however, I wonder whether the specificity of narrowly-focused goals could result in unintended restrictions on the sort of R&D we can do in the future as new problems and capabilities emerge.

I hope, therefore, that the definitions can be kept broad and that the bill's resources can be directed to developing new uses for a variety of types of biomass, including novel materials not available from petroleum sources.

In closing, I would like to thank you again for the courtesy you have shown me in allowing me to present my views. I look forward to working closely with you and your committee as this legislation works its way through the legislative process.

Thank you, Mr. Chairman.

Mr. EWING. Thank you, Mr. Udall.

In just the little comparison between the legislation I have introduced and that which you have introduced, the Department of Energy appears to be on a higher level than USDA on your Biomass Research Development Board. Is there a reason for that, maybe perceived disparity?

Mr. UDALL. There's not any particular reason for that. We had worked, of course, with the Senate efforts of Senator Lugar and we looked at the various ways we might put the bill together and put the advisory groups together, but that's certainly not locked in concrete.

Mr. EWING. You mentioned broad definitions and making—and I understand the reasoning for that, but with the $49 million is not a lot of money for research, and I don't know how far that will go, and we hope maybe we will know better after our hearing today, but if we make it too broad do you think we have a problem of maybe spreading everything too thin and not coming up with as many concrete results as we might hope?

Mr. UDALL. I think you point out the real challenge here is to walk that line between making sure that we give people the sense that we ought to explore every possibility, but in the end, if we have only got $50 million—and I say "only" with acknowledging that still is real money.

Mr. EWING. That's Washington talk, "Only $50 million."

Mr. UDALL. We want to have something to show for it when we get down the line a way, so I acknowledge the concerns here that we have to balance that desire.

Mr. EWING. Fine.

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Are there other Members that have questions of Mr. Udall?

Mr. GUTKNECHT. Mr. Chairman, I just wanted to acknowledge, you made a very important point about fuel load, and it seems to me that there are some people who are unwilling to acknowledge that that is a serious problem.

We have got a big problem in northern Minnesota. We had a terrible wind storm, and we have got an awful lot of downed trees up there, and somehow we have got to figure out, I think, a way to get them out of there; otherwise, we are going to lose a big, big chunk of some very beautiful country because of the fuel load. I am delighted that you at least acknowledge that. Thank you.

Mr. UDALL. If I might respond just briefly, in Colorado we are caught in the dilemma between prescribed burning and maybe some sort of mechanical harvesting. Particularly in the front range you have a lot of brush, you have a lot of wood products that really aren't commercially viable for the kinds of products that would be used in the building of homes and so on, but I think could potentially have a use.

You also have in eastern Colorado, of course, a lot of farming and a lot of farmers that are looking for additional ways to generate revenue, and it is very exciting what is going on, particularly, Mr. Chairman, in your encouragement of the cellulosic side, where literally I have been out to the National Renewable Energy Lab, which is in Colorado, and they have these new enzymes where you can put baseball bats, that kind of material, in a vat, and in a couple of weeks have ethanol.

I know I am overstating it slightly. I know the USDA is sitting behind me here. But that's exciting stuff because we have been so dependent on the high carbohydrate farm materials—corn, in particular—to generate ethanol, and if we could really open this up to even urban waste streams based in cellulose material that we could generate ethanol from.

Mr. EWING. Very good.

Anyone else? Mr. Ose.

Mr. OSE. Thank you, Mr. Chairman.

I would like to echo the remarks of my good friend, Mr. Gutknecht. Many of you have probably seen in the paper here the last few days the significant fires we have been having in California, and I have yet to reconcile the demand for the cellulose fiber and getting to it by means of clearing underbrush and the lack of impetus in the Forest Service, for instance, for timely regular timber sales or now an extension of a moratorium on road development. That is a critical element in my district from a public safety standpoint due to the growth of the underbrush in the forest.

I did not want it to be Minnesota-specific, because it's not. It's also California-specific, and I wanted to echo my good friend's comments.

I appreciate Mark coming and testifying similarly.

Mr. UDALL. Mr. Chairman, just a brief comment, if I might.

Mr. EWING. Yes.

Mr. UDALL. I acknowledge my two freshman colleagues over here.

I do want to point out, too, in my bill, and I believe the chairman is also addressing this in his, there is some research to be done on

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the environmental impacts of harvesting this biomass material and trying, again, to find the balance between protecting the environment, but also using those materials that are there for energy production. So I look forward to that discussion continuing.

Mr. EWING. Thank you. Thank you for your presentation.

Mr. UDALL. Thank you, Mr. Chairman, and thank you to the committee.

Mr. EWING. We are going to look forward to working with you.

Mr. UDALL. Thank you.

Mr. EWING. The Chair intends to continue on and Mr. Barrett will return after he votes and take over the committee, so, Members, feel free to go for the general vote, and also I would encourage you to come back when that is completed.

Our second panel of witnesses, I would like to call them to the table: the Honorable I.M. Gonzalez, Under Secretary for Research, Education, and Economics, U.S. Department of Agriculture; and the Honorable Dan W. Reicher, Assistant Secretary for Energy Efficiency and Renewable Energy, U.S. Department of Energy.

Good morning, gentlemen.

Mr. GONZALEZ. Good morning.

Mr. REICHER. Good morning.

Mr. EWING. Thank you for being here. We will start with you, Mr. Gonzalez.

STATEMENT OF I.M. GONZALEZ, UNDER SECRETARY, RESEARCH, EDUCATION, AND ECONOMICS, U.S. DEPARTMENT OF AGRICULTURE

Mr. GONZALEZ. Thank you very much, Mr. Chairman and members of the committee. It is a pleasure to be with you this morning to give testimony in terms of this important topic. As we have just heard from the comments made by Congressman Udall and the Chair's opening comments, this subject is tremendously important to all of us that are here today and certainly to the Clinton administration. We have had a number of opportunities to review the testimony from others, and I think we are all very much on target in terms of support of this legislation that you have introduced, Mr. Chairman.

If I may, I'd like to introduce some members of my staff at USDA that are here that have been working on these issues of biobased products and bioenergy for some time and would be available to respond to questions as we move through the testimony this morning.

From the Chief Economist's office, Mr. Roger Conway, seated right behind me to my right; Dr. Frank Flora from the Agricultural Research Service; and Dr. Dan Kugler from the Cooperative State Research, Education, and Extension Service, who are here this morning.

To add emphasis to the things you have talked about, Mr. Chairman, already this morning, biomass crops such as poplar, willow, and switch grass, and agricultural waste streams could become important feed stocks of electric power, liquid fuel, and chemical production. In addition, biomass feed stocks can offer significant environmental benefits compared to fossil fuels.

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For example, energy produced from biomass crops does not add greenhouse gasses to the atmosphere like we would from burning of fossil fuels.

Advances in technology in farm production and processing offer enormous market opportunities for the Nation's farmers and hold the potential for transforming a significant portion of our fossil fuel based economy to a biobased economy. The Clinton administration wants to help encourage that transformation.

In recent USDA analysis, in cooperation with the Department of Energy, the results indicated that at $40 per dry ton of energy crops at the farm gate, about 42 million acres could be planted to energy crops by the year 2008, with annual production of 188 million dry tons of biomass feed stock and no significant increase in major commodity prices.

Net farm income is estimated to increase by $5½ billion over the baseline projection from the year 2000 to 2008.

As a part of our testimony, we have a list of programs and projects that we have provided that we hope to enter into the record that give examples of the kind of programs that are ongoing.

I would like to comment on your bill, Mr. Chairman. The administration supports the goals of H.R. 2827, the National Sustainable Fuels and Chemicals Act of 1999, but would prefer to see less-prescriptive language.

USDA believes a mix of directed and competitive research would be best in approach to addressing the issue.

While funding provided under the bill's authorization would have to compete with existing programs under discretionary budget ceilings, we believe that by formalizing cooperation and coordination among the Department of Agriculture, the Department of Energy, and other agencies in sustainable fuels and chemicals research, this legislation would help to reinforce the commitment of the agencies to match resources and realize potential of biofuels and biobased products.

In addition to an Advisory Committee to help focus strategic planning, the development of a joint sustainable fuels and chemicals initiative to carry out the research on biobased industrial products will ensure that the funds from both departments are efficiently and effectively leveraged.

I might add parenthetically that we have continued to work jointly on our programs with both the Department of Energy and the Department of Agriculture in the recent past.

I am pleased to inform the subcommittee that we have improved cooperation across several agencies, and, as we carry out the President's directive, we have been working together to carry out a number of goals of the H.R. 2827.

As you know, President Clinton—and we were made aware earlier—on August 12 came to sign the Executive Order for developing and promoting biobased products and bioenergy, and USDA and DOE are taking steps to meet the requirements of that Executive Order and to accompany the President's memorandum.

USDA currently spends $9 million annually for biofuels research and $63 million annually for research on new industrial uses of bioproducts.

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To coordinate these activities within USDA, Secretary Dan Glickman established a biobased Products Coordination Council, which I chair. In response to Executive Order 13134, the council has been renamed the Biobased Products and Bioenergy Coordination Council.

The Council promotes biobased industrial products research, development, and commercialization through information sharing, implementation of strategic planning, and providing policy advice for the Department.

It is also developing a list of biobased products for use by the Federal agencies and their procurement officials, as directed in Executive Order 13101, the greening of Government initiative.

In my prepared remarks, I have highlighted several areas where USDA is conducting research and administering programs in the area of ethanol research, research on biodiesel and other biobased products, our agricultural utilization research, biomass initiatives, and renewable portfolio standards, and I did bring some products from a recent visit to Iowa, where we are developing some of the new products that are based on soybeans.

In regard to ethanol research, one of the most promising roles biomass can play is strengthening our energy security. In 1995, USDA released a study on the net energy balance of corn ethanol that showed that ethanol contains 22 percent more energy than used to produce the ethanol, itself. And since then technological innovation in corn production and ethanol conversion have substantially reduced the energy required to produce corn ethanol.

Our most recent estimate is that energy content of ethanol is 34 percent greater than the energy used to grow, harvest, and transport corn, produce the ethanol, and distribute the ethanol.

In addition, a recent study conducted by Argonne National Laboratories with USDA collaboration showed both corn and cellulosic ethanol produce significantly fewer greenhouse gas emissions than petroleum.

Research to reduce ethanol production costs can improve the competitiveness of and expand the quality of ethanol use as a fuel or fuel additive. USDA analysis suggests that long-term technology improvements strictly devoted to ethanol production might reduce costs by 9 to 15 cents per gallon.

Our researchers believe that additional savings of 13 to 18 cents per gallon may be possible by developing higher-value products called "coproducts" from raw materials not used up in the ethanol production.

USDA has been conducting research to develop biobased products under the moniker of agricultural utilization for over 50 years, primarily at its four regional utilization centers. I think, given the importance of the topic today, it is good to note that we have been doing this and the continued investment for agricultural research in these areas has been there, and we thank those members of the committee that have provided that support.

Many of the research activities are conducted at the Agricultural Research Service National Center for Agricultural Utilization in Peoria, IL. Other agricultural utilization research is conducted at our ARS facilities in the Eastern Regional Research Center at

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Wyndmoor, PA, and our other regional laboratories in New Orleans and Albany, CA.

Another product that is making significant progress is biodiesel. biodiesel, as well as lubricants, chemicals, and solvents produced from agricultural fats and oils, offer another opportunity to supplant petroleum derivatives. In doing so, an expanded market for agricultural fats and oils may develop, providing farmers with high-volume markets for high-value, non-food products.

Like ethanol, biodiesel has a positive net energy balance. This high energy efficiency translates to a much lower emission of greenhouse gases compared to petroleum-based fuels.

USDA conducted a study with the Department of Energy at our National Renewable Energy Laboratory that found the use of biodiesel reduces net carbon dioxide emissions by 78 percent relative to petroleum diesel.

Selected niche market opportunities for biodiesel are emerging. As a result of the legislation passed last year, Federal agencies can use biofuels, blending 20 percent mixture of biodiesel with the regular diesel, and receive a credit against alternative fuel vehicle purchases.

I am glad to report that in August of 1999 we began using biodiesel fuel at USDA facilities here in the Beltsville, MD area and elsewhere, and we have provided a brochure with a summary of that material for the committee.

I would also like to point out that the Cooperative State Research, Education, and Extension Service provides funding for a number of biobased and bioenergy projects conducted at land grant universities and other academic institutions with agricultural interests, and we continue to work closely with our land grant community and with the private sector in moving these programs forward.

The development and expansion of a renewable fuel and biobased products industry, founded in a strong agricultural and forestry sector, can play an increasingly important role in enhancing energy security, cleaning our environment, and promoting farm and rural economic growth.

Petroleum and fossil fuel prices, feed stock costs, coproduct markets, energy, and environmental policies, and advances in technology are all critical determinants of market growth for both biofuels and biobased products.

The Clinton administration will work with Congress and others to advance the technology and to improve the economics of producing and marketing biofuels and new bioproducts from agricultural commodities.

We are delighted to be part of this testimony today and would welcome any questions that the chairman or the committee members may have.

Thank you very much.

[The prepared statement of Mr. Gonzalez appears at the conclusion of the hearing.]

Mr. BARRETT [presiding]. Thank you sir. I now recognize Mr. Dan Reicher.

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STATEMENT OF DAN W. REICHER, ASSISTANT SECRETARY, ENERGY EFFICIENCY AND RENEWABLE ENERGY, U.S. DEPARTMENT OF ENERGY

Mr. REICHER. Thank you, Mr. Barrett. I very much appreciate the opportunity to testify today.

This hearing and H.R. 2827 are a welcome spur to the effort we in the Department of Energy, under Secretary Richardson, have been pursuing, along with the Department of Agriculture and U.S. companies, to grow an integrated bioenergy that can reduce our dangerous dependence on foreign oil, cut greenhouse gas emissions, and help confront the crisis in the agriculture and forest economies of our Nation.

I am especially pleased to be seated here with Under Secretary Gonzalez, who has been very active in our efforts to implement President Clinton's recent Executive Order, and also move the Government/industry bioenergy initiative forward.

On the first board to your left, Mr. Chairman, you see the broad opportunities for biomass as an energy source. Trees, crops, residues, and organic waste can today be readily converted into large quantities of electric power, a broad array of fuels, and a great number of chemical products.

On the next board you see, unfortunately, Mr. Chairman, the current nascent bioenergy industry is greatly fragmented. Chemical companies are pursuing biomass as a feedstock alternative to petroleum, power companies are pursuing biomass electricity for its environmental and climate change benefits, corn growers, as you know, are producing liquid fuels, the forest products industry derives a great deal of heat energy today from biomass and is focused in the future on producing gaseous fuels to drive turbines.

There is simply not enough integrated work to stimulate an overall bioenergy industry. And, to be honest, Mr. Chairman, we are equally fragmented in the Federal Government with bioenergy-related work being pursued in multiple offices across the Department of Energy, the U.S. Department of Agriculture, and many, many other agencies you see represented here.

However, the good news is that the President's recent Executive Order will be used to better coordinate Federal efforts to accelerate the development of 21st century biobased industries.

In a separate executive memorandum, the President set a goal of tripling U.S. use of biobased products and bioenergy by 2010. He stated that reaching the tripling goal would generate as much as $20 billion a year in new income for farmers and rural communities, while reducing greenhouse gas emissions by as much as 100 million tons a year.

Mr. Chairman, we, of course, know what a successfully-integrated industry looks like. In oil refining, almost 150 years of development has brought us an exquisitely-integrated set of technologies, market signals, and policy drivers that determine at any given moment the highest and best use of a barrel of oil.

The biorefinery of the future holds a similar promise, but achieving this promise will require serious and sustained effort by both industry and government.

We believe it requires greatly-improved technologies, a set of smart supporting policies, and aggressive building of markets, both

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here and abroad. Technology development is absolutely necessary, but not at all sufficient to deliver us bioenergy and biobased products in large quantities at a competitive price.

There are many technology, market, and policy challenges before us. In feed stocks, we have to increase yields of energy crops, improve harvesting, simplify transportation, and overall drive down costs.

In conversion, whether it is cellulose-derived ethanol, biomass cofiring with coal, or gasification, we have to improve efficiency and reliability and, again, drive down cost.

And utilization, the clear but not simple challenge is the following: fuel, power, and chemicals we derive from biomass must be competitive with fossil fuel counterparts in terms of efficiency, environmental impacts, and cost.

In the market arena, biomass supply and demand is obviously key, as are the cost of capital, other competing investment options, and a range of other challenges.

Policy issues also loom large. How will bioenergy be treated in the tax code? How will it be handled in State and Federal electricity restructuring legislation? What will be the impact of environmental regulations?

The bioenergy initiative is a partnership among senior representatives of industry, national laboratories, the Department of Energy, the Department of Agriculture, and other agencies, States, and citizen groups. Very simply, the initiative will help power America by using our most abundant natural research, biomass.

This is our challenge: by making a ton of biomass a viable market competitor to a barrel of imported oil, the bioenergy initiative will help strengthen U.S. energy security, protect the environment, reduce greenhouse gas emissions, and revitalize rural America.

This board lists some of the industrial partners that we are working with. They include entities like the National Corn Growers Association, Archer Daniel Midlands, the DuPont Corporation, and Weyerhauser, to name just a few.

Mr. Chairman, H.R. 2827 is an important step in building an integrated bioenergy industry, recognizing, as it does, the need for better coordination across government and with industry and the critical need for additional resources.

I would offer three brief suggestions.

First, we believe the bill, in the interest of better bioenergy integration, should give greater recognition to the role of biomass-derived electricity, particularly with the opportunities afforded by restructured electricity markets and the environmental challenges faced by the power industry today.

Second, the bill should be complemented by Congressional efforts to stimulate policies and markets friendly to bioenergy through the tax code, loan programs, environmental regulation, and Federal procurement.

I would note, in particular, the importance of extending and expanding the current biomass tax credit, which is pending in the Ways and Means Committee.

Third, agency work must be supported through increased appropriations. My office requested approximately $117 million in fiscal year 2000 for our critical work in biopower, biofuels, chemicals, and

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forest products. To date, Congress has appropriated less than this amount.

To be frank, and as H.R. 2827 recognizes, achieving success in bioenergy and biobased products will require substantially greater Federal funding.

Mr. Chairman, before I conclude my statement, I also want to recognize Mr. Udall's bill, which shares a common goal to enhance and improve the Nation's use of biomass for fuels and industrial processes.

In conclusion, Mr. Chairman, Congress' support and the implementation of the Executive Order, based on those we believe Government and industry can together grow an integrated bioenergy industry that supports key economic, environmental, and security interests of the Nation in the 21st century.

Thank you very much.

[The prepared statement of Mr. Reicher appears at the conclusion of the hearing.]

Mr. BARRETT. Thank you sir. Dr. Gonzalez, as I scanned your written testimony, you stated that you would prefer to see less-prescriptive language. What are you talking about?

Mr. GONZALEZ. Well, as we reviewed the material, I think a balance between the competitive grants part of that initiative and the ongoing long-term research capability that is already available at our utilization labs should be factored into the total initiative process.

I think there are a number of these areas where we thought some additional discussion would be appropriate for us to consider.

Mr. BARRETT. Thank you, sir.

Mr. Reicher, is there a difference between the cost of the blended fuel and the fossil fuel?

Mr. REICHER. Yes, there are differences today in terms of the cost of the petroleum-based fuels versus the cost of biobased fuels.

Mr. BARRETT. Is it sizeable?

Mr. REICHER. It is not insignificant, but the good news is that it is coming down, and quickly. With further improvements, for example, in corn-based ethanol, with the future we see in making ethanol out of a whole host of other biological materials, some of those waste products, we think that any gap can be closed over time.

Just to give you an example, if we can make ethanol out of materials that are wastes that today we pay to get rid of—for example, waste in the rice industry or waste in the sugarcane industry or waste in the corn or other industries—those kinds of products that have a negative value today, if those are what we make ethanol out of, in addition to making ethanol out of corn, we can drive those costs down.

In the area of electricity production, biomass is competing with the cost of coal, the cost of natural gas, and, again, we have got to close that gap, but we are making good progress in that area, as well.

Mr. BARRETT. You mentioned particularly ethanol. Can you give me an example of the difference in cost between, let's say, a gallon of ethanol and a gallon of fossil-based unleaded fuel?

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Mr. REICHER. Mr. Barrett, I have to be careful. I don't have those numbers in my head and I don't—I would hesitate——

Mr. BARRETT. Is it possible for you to supply the committee with those?

Mr. REICHER. We can definitely supply those for the record. We could also plot for you the trajectory that we see in those costs coming down, both the corn-derived ethanol and the cellulosic ethanol.

I am told by my colleagues at the Department of Agriculture that the produced price, petroleum-based around $1.10, ethanol around $1.60, therefore about a 50-cent differential.

Mr. BARRETT. Per gallon?

Mr. REICHER. Per gallon. We think that that differential, again, can be closed, particularly with the improvements we are seeing in both corn-based ethanol and the great opportunities we see in making ethanol from various kinds of biomass waste.

Mr. BARRETT. Thank you very much.

Mr. EWING [presiding]. Thank you, Mr. Barrett, for sitting in and handling that so well.

Mr. Gutknecht.

Mr. GUTKNECHT. Well, Mr. Chairman, I really don't have any questions. I do want to tell all the panelists and the other people gathered here that it is unfortunate we have other meetings. I have another meeting that starts at 11 o'clock, but I appreciate what you are doing. I appreciate this whole concept. I have believed for a long time that when you talk about biomass fuels, particularly ethanol and biodiesel—and I am a strong supporter of biodiesel, as well, because in fact, just this morning I was crossing the street and a bus was taking off, and I remind my colleagues as often as possible that if we could get them to use a 20 percent blend of soybean oil with that diesel, we could cut the amount of smoke coming out of those stacks by about 40 percent, some say even more than that.

So this really is a win/win situation. It's a win for the environment. It's a win for our economy. And in rural America it is a win for our farmers, as well.

So I think the small amount of money that we spend on the research and development of these new biomass fuels it seems to me are going to come back to us.

And back to the question about the differential now in the cost, I really believe that part of the thing that has helped keep the price of a barrel of oil below $30 is the basic notion that at some point our biofuels, and particularly ethanol, becomes incredibly competitive. And so I think part of the reason we are seeing oil prices kept in check is because we have this trump card that we can play, and the stronger we can make that trump card I think, long term, the better for us as an economy.

So I am a strong supporter of this notion and what you folks are doing.

I have no real questions. I do apologize for my colleagues and, as I say, I have another meeting that I have to go to at 11 o'clock. It doesn't mean that this committee and this Congress doesn't take this issue seriously, because more and more Members are realizing, whether they are from rural America or from urban America, that

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this is a win for the environment and it is a win for the economy, as well.

Thank you very much.

Mr. EWING. Thank you.

Mr. Smith.

Mr. SMITH. Mr. Chairman, thanks.

It was about in 1970 or 1971 when OPEC got together and the Arab oil embargo significantly scared the heck out of this country in terms of whether or not we were going to have the energy we needed, so we started an all-out effort at that time promoting both research and subsidization of the development of alternative fuels. At that time, if my memory serves me correctly, we were importing about a third of our energy needs. Now, after 27 years of dedicated research and effort and promotion and subsidy, I think we are importing 55 percent, 58 percent.

For 27 years we have been subsidizing and researching the development of ethanol. Are you suggesting that more somehow can be accomplished in the next several years than we have accomplished over the last 27 years?

Mr. REICHER. If I could, Mr. Smith, I think the answer to that is yes, and the real—there are a number of opportunities. Let me focus on the opportunity that we are working on at the Department of Energy, collaborating with the Department of Agriculture, and that is being able to make ethanol out of a variety of biological materials.

If we can succeed—and we are making very good progress—in producing commercial-scale quantities of ethanol from materials that are today waste products——

Mr. SMITH. Of course, we started doing that in 1972, looking at how you could break down the cellular compositions to have more-efficient and better utilization to make that into usable fuels.

Mr. REICHER. Yes. But what I am talking about is, in addition to the starch that is in the kernel of corn which we are making ethanol from today, the opportunity is to make ethanol from the fibrous part of the rest of the corn plant——

Mr. SMITH. No, but I say we started that in 1972, that research.

Mr. REICHER. I understand, and in 1990 a major breakthrough, which received actually patent number 5,000,000,000 from the Patent Office—it was so significant they gave it that designation—breakthrough was made then, and since that time we have made rapid progress in putting in place the capability to make use of all of these other biological materials. And, in fact, some time this year or next year the first commercial-scale ethanol plant that will make ethanol from these other biological materials—in the case of this project, from waste from the sugarcane industry—will go on line in Louisiana. It's a 20 million-gallon-a-year plant.

If those kinds of projects can go on in Louisiana and California and Illinois—in New York, where there are discussions going on of making ethanol from municipal solid waste, a plant may well be built there.

Mr. SMITH. Are either of you aware of how many ethanol plants have closed down in the last 25 years?

Mr. REICHER. I understand there have been plants that have closed down.

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Mr. SMITH. Hundreds, at least. Just in my neighborhood, alone, there have been three plants closed down.

Mr. GONZALEZ. Mr. Smith, I think your question targets where we have been, and I think the most recent move toward the commercialization of alternative crops to this total arena, and I think particularly important, as we continue to move forward with legislation and support for this area is the fact that we have had the demonstration sites, we have been looking at other products other than only our agricultural commodities, although that is still a major focus for us. But the question earlier about the forestry component, when we look at the number of trees that are down and, through a pruning process or——

Mr. SMITH. As a corn farmer, of course, I am interested in the utilization of corn.

Mr. GONZALEZ. Exactly.

Mr. SMITH. As an American, I am interested in the production of more-efficient energy to give us greater independence.

Have we fallen down in the amount of research that has been done? Has that been one of the problems? Who is doing the research right now?

Mr. GONZALEZ. Energy——

Mr. SMITH. Is [the Department of] Agriculture?

Mr. GONZALEZ. We have agricultural research that continues to go on that has been in place. As I mentioned earlier in my testimony, for 50 years we have been working on some of the basic research as it moves to the applied side.

But the question—and, again, from my standpoint, one of the places where I think we have had additional need is in the education of what these things mean to the general consumer—that they have alternatives, that they are environmentally friendly, that we take advantage of that research and move it to the next stage, which has been in the recent past and through the collaborative work that we are doing with Energy and Agriculture now, is to get it commercialized.

Mr. SMITH. Is the Department of Energy or Agriculture doing more research in alternative fuels? Well, I guess that would be definitely Energy. How about ethanol?

Mr. REICHER. I think the larger investment of Federal dollars is on the Department of Energy side than the Department of Agriculture side.

Let me say that we have a research goal, a production goal of 75-cents a gallon of ethanol made from these other biological materials. What we have been chasing, frankly, is the cost of oil.

As you know, oil has gotten down to a point over the last year or two at $10 or $12 a barrel, so it has been difficult to compete with that declining price of oil.

We think, though, that, with this continued progress we are making in driving down the cost of making ethanol out of these other materials, including, as I say, the rest of the corn plant, we think we are going to be able to compete readily with oil over time.

I would mention one other part of this—and this is what is interesting—is that we are not only looking at making ethanol from these materials, but when you make ethanol, as you know, you can pull a variety of other products out of the material that you can

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burn to make electricity, that you can use to make chemicals, and so this option of producing other coproducts in what we call a biorefinery really may be the key to this—drive down the cost of producing the ethanol and get some money out of selling those other coproducts.

And we think we will be able to compete with oil. Obviously, though, I am first to admit that oil at $10 or $12 a barrel is tough to compete with.

Mr. SMITH. Mr. Chairman, through you to them, may I request that the committee be furnished a review of the research and where it is done and how much we have contributed to that research in the last 5 years or 10 years or something?

Mr. REICHER. We would be pleased to provide it over the last decade. That would make sense, and we could work on that together.

Mr. EWING. Thank you.

Mr. Reicher, I am sorry I missed your testimony, but I appreciate your being here.

How much money are other countries spending in this type of research? Do we know? Do we have an idea? And who might be doing a lot of research in this area?

Mr. REICHER. Mr. Ewing, I don't know the spending figures for those other countries. We definitely can provide you those for the record.

I would say that, in terms of ethanol production, the world leader is Brazil, and they produce on the order of double what we produce in this country.

There is great activity going on in the Scandinavian countries, for example, in looking at—not looking at, but actually producing power and producing fuels from products from their forest industry, and there are great advances in technology being made there.

The Japanese and the Indians, as well, have been very active in this work.

One of the active areas internationally has been in biocatalysts and enzymes, improving the bacteria and other materials that you use to break down these biomass materials to make ethanol.

So there is something of a race going on worldwide to be the leader in these technologies, because there is, frankly, a huge market.

We are working on a technology called "gasification," which will allow us to take biological materials, turn them into a gas that could be used like natural gas to operate a turbine and make electricity. That is a very promising technology.

The forest products industry is looking at that to get rid of a lot of their wastes, and they could become a net generator of electricity.

If we can proceed in that technology, we will have huge international markets from developing countries where there's lots and lots of biomass to be used through the forest-products-based countries around the globe.

Mr. EWING. The world market for ethanol, is that as the blend in gasolines for clean air? I mean, Argentina is a major producer. Do they use it locally, or do they export it? Brazil. You said Brazil, not Argentina.

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Mr. REICHER. Brazil uses it mostly domestically. I am not aware—there is some export.

Mr. EWING. But it is mostly for domestic?

Mr. REICHER. My understanding is it is mostly for domestic use, and this is, to a large extent, based on the growth of sugarcane.

Mr. EWING. Do you feel that this legislation will ensure a net improvement in our environmental quality? Do you think that this is a way to go in that regard? This question is to both of you, Mr. Reicher and Mr. Gonzalez.

Mr. GONZALEZ. Mr. Chairman, I do believe, based on the ongoing research that we have had, and as was pointed out earlier, the reduction of emissions using a blend, if you will, of the biodiesel with regular petroleum-based product, is significant. We think that's where the advantage is to the American consumer is to have these alternatives of products, new products, that not only produce energy but utilize our commodities—corn and soybean and other products from the forest area—for both increasing the economic value, as well as adding to this benign or friendly environmental impact.

In fact, the products that I have here that I brought as a sample for you, this is the soy-based fifth wheel grease for the semi trucks and others.

But, again, the fact that we know that we lose this product into the environment as we go down the road, and we know now that it will have no negative impact I think is an indication of the kind of impact that we will see for the long term.

The same way when we look at forest products. This is a little sample. I know that we are a long way away, but this is a little sample of the oil used on chain saws on the bar oil. That, again, we lose it into the environment, and, again, it has a friendly impact, if you will, in the use of it.

So there are a number of these where we are looking at. In fact, Department of Energy, at our Sandia Labs, is testing the hydraulic oil. Again, we use a lot of hydraulic oil for a lot of areas, not only in agriculture but industrial.

So the industrial side of the development of application of research through the commercialization I think not only provides those additional economic opportunities, but they will be environmentally friendly.

Mr. REICHER. Mr. Chairman, if I could, quickly, first of all, as Under Secretary Gonzalez has mentioned, we can cut traditional air pollutants—the sulfur dioxides, nitrogen oxides, all of that—with the use of biomass in its various forms.

Second, we can also cut greenhouse gas emissions. The real benefit of biomass, unlike fossil fuels, is the following: with fossil fuels, when you dig them up and you burn them you are introducing carbon dioxide for the first time to the atmosphere that has been trapped underground, and that is obviously the key global warming gas.

In the case of biomass, when the tree or the corn plant grows, it pulls carbon dioxide out of the air. When you use it in some form through bioenergy, it releases about the same amount back to the atmosphere, so we say that it is carbon neutral—you are not increasing or decreasing.

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So one of the big benefits of biomass from a climate change perspective is that it is carbon neutral.

I mention, for example, the forest products industry. If they can make this jump to this newer technology to gasify their waste, they can cut emissions of global warming gases by 30, 40, 50 million metric tons a year, and that's a huge cut in those emissions, to say nothing of the traditional air pollution.

Similarly, we can make changes like that in automobiles and in a variety of other uses of these materials.

Mr. EWING. I am going to indulge the privilege of being chairman here and ask one more follow-up question, which is where I was really trying to get.

Please, either of you indicate if I am too parochial in my view, but in Illinois we try and put back on our land what is left of the corn plant after we harvest. It's the same with beans. And that is something that the environmentalists and conservationists look at very closely as protection for the ground during the winter months when it is open and there are no crops on it.

Do you think that there is, indeed, a place that we should be considering taking this off and using it for further development of ethanol or biomass products that would have an impact on the environment in at least our area of agriculture in Illinois?

We are going to hear from my good friend, Doug Wilson, of the Corn Growers later, and he will certainly give me his idea. I'd like to have yours.

Mr. REICHER. Obviously, Mr. Chairman, when you look at a crop or a tree, a forest or a field, some of that material needs to stay to improve the soil as cover and all of that.

I think what the scientists tell us, though, is that some proportion of that—perhaps more than what we are using today—could be used to produce energy in various ways.

So, for example, the corn plant, as I understand it—you know more than I—that is harvested today, the Stover variety of parts of it, and some of that can be used to produce additional products and energy sources, and without harm to those fields. The key is striking a balance between how much you leave and how much you take, and I think enough is understood by the agricultural scientists to know how to strike that balance, and, obviously, we would be very, very sensitive to that.

The good news is that there is an overwhelming amount of biomass available in this country to make fuels and to make products. We don't lack for biomass across this country, both in the agriculture community and in the forest community.

Mr. EWING. Thank you.

Mr. GONZALEZ. I would just add that, given the nature and availability of this biomass, that it is regional. As we look at different products and different crops, the opportunity is for us to take some of that off the land at the appropriate time to cut down on the negative side or negative impact.

So, given the nature of agriculture and its regionality and the peculiarities of each of our crops, I think, again, the research that we have conducted points out the opportunity that we have for a variety of uses for those products.

Mr. EWING. Thank you.

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Mr. LaHood.

Mr. LAHOOD. Secretary Gonzalez, thank you for being here. Thank you for visiting the lab in Peoria. I know that the people there were thrilled with the opportunity to meet you and know of your interest in the work that goes on there.

Mr. GONZALEZ. Thank you, sir.

Mr. LAHOOD. You have hit all the right notes with this Member. You mentioned ethanol, Caterpillar, and the Peoria Lab. [Laughter.]

I don't know what more you could have done in this statement for me.

Let me just ask you a question. I have made note over the last few years that the other labs—New Orleans, Albany, and Philadelphia—have actually received increases in funding. Peoria has not.

Now, I know Peoria is undergoing a major renovation. We have benefitted by a multi-million-dollar renovation at the facility to bring it up to a state-of-the-art facility, but in terms of program, and so forth, do you anticipate additional funding for the lab in Peoria? Maybe not—well, on the same level as the increases have been for the other three labs?

Mr. GONZALEZ. Mr. LaHood, thank you for the question. Mr. Chairman, as we look at the product utilization laboratories that we have in our system, one of the things that we have worked with is not only to continue to modernize the facilities around the country, but also to take a look at our priorities in terms of the research agenda right now and knowing that we have limited funds for some of these areas.

So we have taken a step at a time, if you will, to be sure that we continue to focus on those priorities that are the highest in a given year and continue to move to bring all of our facilities up to speed, if you will.

Certainly more funding in these areas of research, and particularly when we look at new products or new uses of traditional products, and knowing the kind of facility and the research agenda that we have at our facility in Peoria, it is a high priority for us and we will continue to work on that and we will, of course, need your help to get that done.

Mr. LAHOOD. Well, you will have that. I think you realize—I know you realize, and I think those of us who have these labs in our areas know that they are the future of agriculture and they provide an enormous amount of opportunity for development of so many different products and byproducts, and the Agriculture Lab in Peoria is quite historic in many of the things that have been developed there and the research that goes on, and I am awfully proud that we do have that facility there.

One of the things that we were able to include last year was the notion that we try and assign to the lab an opportunity to look at better uses of animal waste, particularly as it relates to these mega-hog operations that have developed around our State.

I am sure you don't know the answer now, but I wonder if you could just give us a progress report some time by way of letter or memo or something on what is happening with the status of that and their ability to really look at how we can control the environ-

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ment, the smell and so forth, as a result of these mega-hog operations.

I know that we have included some language, and I know Chairman Ewing had included some language for the University of Illinois also for this type of research.

I don't know if that has begun or if it is in the works.

Mr. GONZALEZ. Mr. LaHood, Mr. Chairman, we have some of that that has begun. I think when we hear the testimony from some of our university partners, that there may be some indication as to where we are in that process.

I will say to you that those are the priority areas that I think have emerged, and we have some of that research going on at different places.

I think the industry—one of the things that we have not talked about a great deal this morning, but what we will, I am sure, hear is that the industry component, the support and increased funding from industry for these programs that we are talking about this morning, is tremendously important, and commercialization as a part of the research agenda through CRADAS or whatever other instruments that we have had—and certainly the importance of the university relationship with our Federal departments—is tremendously important and on target in terms of the direction.

So we will provide you with an update on those.

Mr. LAHOOD. The other thing I would say is I recently had the occasion to visit the ADM facilities in Decatur. One of the things they are doing there now, they have a whole new business of the development of vitamins, particularly—they have a whole building where they just produce vitamin E, and they are building a structure where they are going to produce vitamin C, and I don't think—all as a result of using the byproducts of soybeans. I know they would not have been able to do these kinds of things if it weren't for the research that goes on in Peoria, and perhaps in some of these other labs.

So I just think there are things that go on in these labs that have enabled businesses to provide spin-off businesses and do things that provide good, healthy things for people, whether it is vitamins or other byproducts.

I know it is true of Staley in Decatur, so we appreciate the support we get for the Agriculture Lab. We appreciate the work that you do. I hope that you will keep us somewhere at the top of your list for additional funding.

Thank you, Mr. Chairman.

Mr. EWING. Thank you very much.

Mr. Ose.

Mr. OSE. Thank you, Mr. Chairman.

Again, I pay my respects to my good friend from the south.

My immediate question has to do with my specific district. I have around 500,000 acres of rice in my district, and in California we have a law that prevents the burning of rice stubble, which forces our farmers to either till it back under or to let it be harvested into rice bales.

As a result of this dilemma of what to do with the stubble in my district, there is a cooperative project called "The Gridley Rice Straw Project" in Oreville—notice I said Gridley Rice Straw Project

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in Oreville. We are very generous around California—the purpose of which is to use technology to convert the rice straw into ethanol. It has received some funding. I am hopeful of receiving additional funding.

Mr. Chairman, you and I have spoken very briefly about your piece of legislation and including, in addition to corn, applying it also to rice, and I'd appreciate any comments you might care to add, but I'd be curious of the level of knowledge, in particular, that Mr. Reicher has of this project and its current status.

Mr. REICHER. Congressman, we are quite supportive of this project. This is another example of, we think, the great opportunity to use what are today often wastes in the agricultural industry to produce ethanol at a very, very competitive price.

These are materials that often cost to get rid of, and if you have a situation like that the input is very cheap to produce ethanol, so it has got great opportunities going forward.

In terms of this project, specifically, we have been supporting it. We, in fiscal year 2000, are looking at on the order of about $5 million for the company, BC International, that is doing the research, development, and deployment of this technology at plants in both Louisiana and in California, including Gridley. We are working very closely with BCI. I have spoken on several occasions to the chairman of that company. He was there when the President rolled out the Executive Order, when Senator Lugar was in attendance, as well, and we think this holds great promise, and we are very strongly supportive of these projects, including the Gridley project.

Mr. OSE. Would it fit within the parameters of Chairman Ewing's legislation to, for instance, expand from corn only to corn and rice the application of 2827?

Mr. REICHER. Our view of 2827, of Mr. Udall's bill, of the Executive Order is that they all need to be broadly focused on biomass, generally. There are all sorts of opportunities across all of these product areas in both agriculture and in forestry to make use of the very same technologies. The same bacteria that you could use to break down the cellulose in a corn stalk you can use to break down the cellulose in rice straw, you can use to break down the cellulose in the organic fraction of municipal solid waste, believe it or not.

So we think we have got to approach it overall as the material that it is, which is biomass, and, just like we look at a barrel of oil, we have got to look at a ton of biomass and look at its potential.

Reflecting back on what Congressman LaHood was talking about, one of the real opportunities with these materials are the coproducts. Pulling out of these materials not only the primary product, which might be a liquid fuel, it might be something else, but also the coproducts.

For example, in the case of the rice straw, there will be materials left over that can be burned to make electricity. In the case of making ethanol, there is a whole host of products that can be used for other beneficial purposes.

And the beauty of that is that you can improve the economics of producing, whether it is a gallon of ethanol or a BTU of electricity or whatever else you are after, by making use of those coproducts.

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Mr. OSE. Mr. Chairman, the reason I asked for that dissertation was that the project in Gridley and Oreville is kind of a three-pronged deal. For 4 months of the year we use rice straw and rice hulls, 4 months of the year we use waste or biomass, if you will, from the forest, and the other 4 months of the year we are kind of looking around, looking for any inputs we can.

I do see my time has expired. I would appreciate, if we are going to have a second round, asking the question about how do we get biomass out of the forest to use in these plants, rather than allowing it to burn, as it is doing today in California.

With that, I thank you.

Mr. EWING. Congressman Ose, you have got one choice. You can either use rice or stuff from the forest. You don't get to put two in. [Laughter.]

Mr. OSE. Actually, Mr. Chairman, the technology we are looking at in Gridley allows us to use rice for about 4 months of the year. For 4 months of the year we use the forest material, and then we are looking for a third source to use the rest of the year, so it is actually very flexible.

I know where you are headed. I am not going to go there. [Laughter.]

Mr. EWING. I mentioned rice in my opening statement, so you—but if you have another question, do it, because we probably will not have another round.

Mr. OSE. All right. My final question—and I made this point earlier with Congressman Udall—is that we have a terrible problem in California, and particularly in the northern districts, about the underbrush or the undergrowth in the national forests and on private property.

On private property, the harvesting or the clearing of that underbrush is not a problem. On the Forest Service ground it is. And what we see today is significant conflagrations on Forest Service ground that is effectively using this as fuel, the consequence of which is a decline in public safety and, in some cases, people lose their homes.

What I am trying to do is find the balance, as Mr. Udall said, between getting that product out of the forest in a timely and environmentally sound manner and using it to fill, for instance, the 4 months demand at the Gridley plant.

I'd appreciate any input you might have on that.

Mr. REICHER. Mr. Ose, this past August we sponsored a major conference in the Lake Tahoe area on this very subject, looking at the problems of fire caused by the growth of these materials in the underbrush, and what emerged from that meeting was a pretty strong recognition that, if we can get these materials out of the forest in an economic way, there are a variety of things we can do with them. We can make power on a modular basis—that is, we can make electricity. We can make fuels, as would happen at Gridley.

The issue is getting access to those for us, being able to pull this material out in a way that is environmentally sensitive and is economic.

We are working towards that end, because there is a terrific challenge out there in terms of these forest fires, but it is going to

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require some additional progress and technology, it's going to require some policy decisions about access to those forests, and also working through these market mechanisms to make sure that we have got markets for the electricity or for the liquid fuels.

Mr. OSE. As it relates to the policy decisions, I would hope that, when the discussion is taking place, for instance, at the DOE, there is direct input that a blanket policy of taking 40 million acres and unilaterally putting them aside does not serve the interest of the forest if the net result is that the under brush grows, we get a lightning strike, and all of the sudden we have a conflagration.

Mr. REICHER. Yes. I made that point in my remarks to this conference. I was there, helped open it, and I stressed the need to strike a balance in terms of the policies that do get set.

And I think the opportunity we have here is that the technology has progressed to a point where we can make use of that material effectively and improve, for example, the California environment in the process, because, again, we would be using biologically-based materials. It would help cut traditional pollutants, it would help cut greenhouse gas emissions, so it could end up being a win/win, not only for the forests, themselves, but for the overall California and western environment.

Mr. OSE. Mr. Chairman, you have been very generous to this freshman. I thank you.

Mr. EWING. Thank you.

Now, Mr. Condit, the ranking member of the subcommittee.

Mr. CONDIT. Thank you, Mr. Chairman.

I just simply want to thank you for holding the hearing and welcome the witnesses. I am sorry I wasn't here for the first panel, but I'd welcome the witnesses, and particularly those from California. This is an interesting industry in California. It is a very important industry. The University of California system is working very hard to create environmentally-friendly transportation and manufacturing processes, and all the witnesses, as Mr. Ose has done, will point out some of the issues, such as wood waste, rice straw, specialty crops that are being provided, already being used to generate biomass energy produced in California.

This is a very important issue, and, Mr. Chairman, I appreciate the opportunity to have these people here and make us better informed about this. It's one of those issues that I am sure we are going to revisit.

With that, I have a statement I would like to submit for the record.

I have no questions for this panel.

If I may, I would like to yield to the ranking member of the full committee, Mr. Stenholm, and let him use the balance of my time if he likes.

Mr. EWING. Mr. Stenholm is recognized, and thank you for your participation.

Mr. STENHOLM. Thank you, Mr. Chairman.

Following up, Mr. Reicher, on a comment you made in response to Mr. Ose's question a moment ago, can you tell us about the types of research ongoing in regard to the use of livestock and/or poultry waste for bioproduct and bioenergy? And, in doing so, talk

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about some of the main issues involved in making the use of animal or poultry waste a viable alternative.

Mr. REICHER. Mr. Stenholm, there is a variety of research going on, both Government research and industry research, university research, on how you can take a whole host of wastes—pig waste, chicken waste, waste from the cattle industry—and do useful things with it.

There are a variety of things that are either in use or being explored. One is gasifying it—turning it into a gas that you can fire a turbine with and make electricity. Another would be to use it to make liquid fuels like ethanol. Another would be to potentially make various kinds of products from it—things that would avoid having to, in the cases where this is a problem, spread it on the ground where it could get into waterways.

That work is going on. DOE supports some of it. EPA supports some of it, Department of Agriculture, and there's a lot of interest in industry.

I will give you a specific example. As we speak, in North Carolina there is a real problem as a result of the floods with a lot of animal waste being carried off by the floods and how to deal with that issue very directly and in very much of a health and safety context.

So we think more needs to be done on both the Government side and the industry side. There's big potential to produce energy and other products from this material. There is, in pending tax legislation, credits that would extend to not only biomass but to some of the animal wastes, as well, to encourage their use in power generation. All of these things—R&D supportive tax policy, stimulating markets are important if we are going to deal better with this problem.

Mr. STENHOLM. Is there any particular line of research or research effort in any of the governmental entities you mentioned that is showing more promise than other? Any suggestion of where we might need to target scarce resources for quicker, better results in this area? Or is it still pretty much in the explorative sense?

Mr. REICHER. Well, there are clearly things we can do today with these wastes—for example, to generate energy. The issue is how you can improve the efficiency of their use and drive the cost down.

I think what may be most useful, Mr. Stenholm, would be we could jointly and probably with EPA provide the subcommittee with a quick overview of all that is going on and suggest where the gaps are, because there are gaps today in terms of the research that is underway.

Mr. REICHER. And then most importantly, I think, how to actually stimulate the use of these technologies, that's the key.

As I said earlier—I think before you came in—one of our real challenges is that we are always competing with relatively low energy prices in this country, and so the emergency of these kinds of technologies is always a challenge when you are in that regime.

But, given the environmental imperatives we have today with trying to deal with this animal waste, we think there is a pretty bright future for producing energy from these materials, and we could supply a review for you if that would be helpful.

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Mr. STENHOLM. I take it from your answer there that you see the biomass industry as having multifaceted possibilities, and that we need to be looking at more broadly-focused sources, and are looking, I guess I should say—if I understood you correctly, we are looking at more broadly-focused sources of biomass and energy through our research effort, and would need to continue in that direction, rather than narrowing it down to one or two particular or three areas.

Mr. REICHER. Yes. A ton of biomass, whatever it is, you can make electricity out of it, you can make liquid fuels out of it, you can make chemicals and chemical-based products out of it. That's sort of the general range. And so what we are doing with agriculture and with industry is to sort of move that whole raft of possibilities forward, and in doing so make sure that we maximize the use of that ton of biomass. Pull all the possible products out of it so we can improve the economics and, in a sense, compete with other traditional energy sources, and that's really the key to make it work in the economy.

Mr. EWING. Mr. LaHood.

Mr. LAHOOD. Thank you for allowing me to ask one more question.

Since we have been talking so much about ethanol here today, I wonder if either of you or your staff have had a chance to look at H.R. 11, which I think would be a terrible setback for the ethanol industry. It is the Brian Bilbray bill which has been marked up in the Subcommittee on Commerce. This would be the beginning of the death knell, one of the death knells for the ethanol industry if this bill were to pass, which would exempt the provision for California for MTBE. I think it would be a terrible, terrible mistake for the full committee to pass it.

But, since we have talked to much about ethanol and you have emphasized it in your testimony, I wonder if either of you have had a chance to look at it. If not, you can, perhaps, when you send the other information, send that, what your feelings are about that, which I, obviously, think would be a very, very bad bill to pass.

Mr. REICHER. As I understand it, the bill would eliminate the oxygenate requirement to get at this issue of MTBE. Oxygenates, we believe, overall are important in gasoline as a way to fight traditional air pollution problems that come out of the tailpipe. It is also clear that MTBE does pose some environmental risk in terms of ground water, and, therefore, we do need to reduce its use.

The question is: how much do we need to reduce its use and how fast do we need to reduce it?

I think, when all is said and done, the good news is that ethanol is a very good alternative to MTBE. It is a good oxygenate, and it is one that we ought to keep in the mix. In fact, the challenge is that if we ramp down MTBE use, the challenge is how quickly we can ramp up ethanol production to replace that MTBE use.

Mr. LAHOOD. That would be no problem at all.

Mr. REICHER. We hope you are right, and we think ramping it up is, in a sense, twofold. It's both ramping up the traditional corn-based ethanol, we also think it's ramping up the cellulosic ethanol, being able to make ethanol from the rest of the corn plant and all those other biological materials and waste that are out there today.

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If we take that two-prong approach, we think we can make sure that there are adequate supplies of this good oxygenate as the country moves to limit the use of MTBE.

Mr. GONZALEZ. Mr. Chairman and Mr. LaHood, I'd like to ask Roger Conway to respond to that question.

Mr. CONWAY. Thank you.

We provided information for the EPA MTBE Blue Ribbon Panel indicating that over 4 years that corn ethanol could meet the requirements in terms of the oxygenate, and also much of the octane in the United States without much of a problem.

The petroleum industry had indicated that they would need 4 years to make any such adjustments. When we did our economic analysis, we based it on their needs to have a 4-year window. In addition, the ethanol industry indicated that they felt—Jack Huggins from Williams Industry was the speaker that day—indicated that they would be able to ramp up the industry to meet that demand, so that information we do have on the record.

In a general statement that Administrator Browner has made, once the MTBE EPA Blue Ribbon Panel made its recommendations, she indicated that MTBE use needed to be reduced. At the same time, she indicated strongly that renewables such as ethanol needed to have their market maintained, and the administration feels very strongly about that.

Mr. EWING. Thank you.

Mr. Goode.

Mr. GOODE. Pass, Mr. Chairman.

Mr. EWING. Well, Mr. Gonzalez and Mr. Reicher, thank you very much. It has been an interesting discussion, and you have been very helpful.

You are excused.

Mr. GONZALEZ. Thank you very much.

Mr. REICHER. Thank you, Mr. Chairman.

Mr. EWING. We will call the third panel to the table.

Gentlemen, thank you for being here today. It is a great pleasure for me to introduce Dr. Don A. Holt, senior associate dean, College of Agricultural, Consumer, and Environmental Sciences at the University of Illinois in Urbana, IL. Mr. Holt has had a very distinguished career at the most outstanding agricultural university in the country, which just happens to be located in my district.

So welcome, Don, and thank you for being here.

Mr. Richard Jones is Chair of the Experiment State Committee on Organization and Policy, and director, Florida Agricultural Experiment Station, University of Florida, Gainesville, FL; Mr. Doug A. Wilson, president of the Illinois Corn Growers Association from Gridley, IL, on behalf of the National Corn Growers Association, and also a constituent of mine from Illinois.

Welcome, Doug. It is very good to have you.

Mr. Mike Yost, chairman of the American Soybean Association, Murdock, MN. Welcome.

And Mr. Paul E. Desrochers, director of fuel procurement, Thermo Ecotek Corporation, Roseville, CA.

Gentlemen, thank you very much for being here and for sitting through the first two panels.

We will start with you, Mr. Holt.

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STATEMENT OF DON A. HOLT, SENIOR ASSOCIATE DEAN, COLLEGE OF AGRICULTURAL, CONSUMER, AND ENVIRONMENTAL SCIENCES, UNIVERSITY OF ILLINOIS, URBANA, IL

Mr. HOLT. Thank you, Congressman Ewing and members of the subcommittee. I appreciate this opportunity to testify on H.R. 2827.

Needless to say, this topic is of great interest within my institution and the land grant university community, in general, and all its stakeholders throughout the Nation.

Over my 7 years as a farmer, 19 years as a researcher, and 18 years as an administrator of research programs, I have had the opportunity to see a lot of very interesting and promising research projects that would result in new renewable fuels and chemical feedstocks. I detailed some of those in my written testimony.

What has been frustrating, however, in watching these projects is that there were rarely sufficient resources to pursue these promising possibilities as aggressively and strategically as would be justified by their potential, and we see H.R. 2827 as promising to help alleviate that bad situation.

I think H.R. 2827 is particularly timely, also, in that advances in biotechnology open up an incredible number of new food and non-food products that can be produced in and by plants, animals, and microbes. Many of these fall into the categories of renewable fuels and chemical feedstocks.

Inevitably, the new and improved products envisioned by this legislation will be produced in complex, multi-stage, value-added enterprises carried out by producers, processors, distributors, retailers, and consumers of new products and by suppliers of inputs and support services.

Also inevitable is the need for unprecedented levels of communication and coordination up and down those complex value chains.

Likewise, the research and development efforts creating and supporting these complex value chains will, inevitably, need to be coordinated and integrated over diverse disciplines, research and development functions—and by that I mean basic, developmental, and adaptive research and technology transfer—and steps in complex, value-added processes.

They will have to address not only technical characteristics of the new and improved products, but also their marketability and potential environmental, social, legal, safety, and political implications.

To state this need another way, we need to move from the linear paradigm of research and development organization toward the parallel approach, and to talk about that I'd like to refer to the diagram that is attached to my testimony.

In the parallel approach, research and development functions are conducted simultaneously instead of sequentially. Activities are organized around practical goals and evaluated in terms of whether the goals are achieved.

At the University of Illinois, we have gained some experience with the parallel approach, thanks to strong encouragement and support of a stakeholder group known as the Illinois Council for Food and Agriculture Research, or C-FAR.

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C-FAR insists that research sponsored by C-FAR funds, which are State funds, be not only tactically but also strategically sound and organized in the parallel manner.

Our experience is that it is hard, especially in public institutions, to make the transition from the linear to the parallel approach. The parallel approach requires more planning, team building, and monitoring of progress, and much more coordination. The transaction costs are high and need to be kept to a minimum. Overall project costs are high, because each effort necessarily has many component subprojects. All the pieces of the puzzle eventually have to come together and fit.

The situation is further complicated by the fact that few institutions, agencies, or private firms have all the research resources and capabilities needed to conduct useful research and educational programs in support of all stages of any of these complex value chains.

On the other hand, there are many benefits to the parallel approach. Overall progress is more rapid, which, in the long run, saves resources and helps meet time constraints imposed by competition. And, of course, that's the whole point of the parallel approach.

Bottlenecks and other problems are anticipated or detected early and circumvented. Progress is easier to measure, since clear goals are established.

Students, professors, and other cooperators involved in projects of this nature gain valuable experience in team efforts, learn how to work effectively with specialists in other disciplines, and become more aware of the importance of their individual contribution in each overall effort. This approach does not restrict the creativity and flexibility of basic scientists, as was a major fear initially.

An important and tangible benefit is the shared vision, commitment, and entrepreneurial spirit engendered by functionally-integrated projects.

We strongly support the vision embodied in H.R. 2827 and hope that, as its provisions are implemented, procedures and protocols will foster and expedite the complex, multidisciplinary, cross-functional, inter-institutional team efforts required for success in research on sustainable fuels and chemical feedstocks.

Thank you for the opportunity to express views on this important matter.

[The prepared statement of Mr. Holt appears at the conclusion of the hearing.]

Mr. EWING. Mr. Jones, you may proceed.

STATEMENT OF RICHARD L. JONES, CHAIR, EXPERIMENT STATION COMMITTEE ON ORGANIZATION AND POLICY, AND DIRECTOR, FLORIDA AGRICULTURAL EXPERIMENT STATION, UNIVERSITY OF FLORIDA, GAINESVILLE, FL

Mr. JONES. Thank you, Mr. Chairman.

Mr. Chairman, members of the subcommittee, I appreciate the opportunity to speak to you today regarding H.R. 2827, the National Sustainable Fuels and Chemicals Act of 1999. I am speaking in my capacity as Chair of the Experiment Station Committee on Organization and Policy, which represents the State agricultural experiment stations across the United States. As well, my remarks

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have been developed in consultation with some of our colleagues in the Extension Committee on Organization and Policy, which represents the Cooperative Extension System.

To facilitate our discussions here today, I will target my comments to the legislative language of this bill, rather than providing a more-technical narrative regarding the merits of specifically areas of biomass and biofuels research; however, we will be more than happy to provide detail and technical background to the members and staff of the committee on any of the following points.

We support H.R. 2827. We commend the Congress and the administration for the bipartisan and bicameral approach that has been taken to improve research on the conversion of biomass into biobased industrial products. It is remarkable to see the breadth of support that this legislation enjoys, with approval coming from farm, industry, and environmental groups.

The administration is already moving to implement the intent of provisions developed in this legislation. These beginning efforts to facilitative, multi-agency cooperative cooperation between the Department of Energy and the Department of Agriculture are commendable.

The level of support and cooperation speaks well to the importance of this legislation. Like other groups, we would like to make some recommendations that we think would further strengthen the bill, but we see it as fundamentally sound and well-developed legislation.

We concur with the value and need to promote biomass and biofuels industries. Supporting the increased use of biomass to develop other biofuels and other biobased products has a number of benefits:

First, the development of alternative fuel sources, which thereby reduce U.S. dependency on foreign sources and provide alternative energy sources in the future when petroleum reserves begin to decline.

Second, benefitting to the environment by potentially cleaner fuel combustion emissions, increased carbon sequestration and biomass crops, and providing alternative crops and farm practices in fragile areas where production of traditional crops and practices could be detrimental.

Third, turning agricultural waste into useful products, such as the use of sugarcane processing residue.

Fourth, development of alternative crops and markets for agricultural producers and processors.

And, fifth, development of biobased energy industries that capture capital and economic resources in rural communities.

Mr. Chairman, despite economic constraints due to what, in my opinion, are very under-valued fossil fuels, the directions set forth by H.R. 2827 are really our only options for a sustainable energy supply in the future.

We support a comprehensive, market-oriented problem-solving approach. Many of the discussions regarding increased use of biomass for developing biobased products focus on reducing the cost of production and processing. This is important; however, this is also a systems problem in that biomass producers need assurances that they will have a steady biomass supply, while biomass produc-

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ers need assurances of a steady market demand. Both the supply and demand have to emerge together.

Moreover, making biomass products price competitive with fossil fuels and petroleum-based products requires innovative and integrated approaches.

For example, a major cost limitation in the use of grass crops for biomass products is the cost of transportation. It can cost too much to dry the grass, which makes it much lighter for shipment. As well, biofuel and biobased products derived from a grass crop may not be cost effective by themselves. However, innovative projects have emerged that simultaneously address the issues of transportation, fuel production, and biomass-based products.

In one instance, a small processing plant was established on a farm, which took care of the transportation cost. The plant was small enough so that it did not need a larger supply of biomass, which might not be readily available or steadily available in the area.

The farmer generated energy that he used in his own operations, and the surplus energy was sold back into the local power grid. A byproduct of the energy generation is used for feeding his livestock.

The farmer calculated that the combination of all these activities made these efforts profitable, as a whole, but removing any of these components would have made the enterprise unprofitable.

Because of these complexities, H.R. 2827 could be strengthened by more clearly stating the need for targeting some of the supported research to address the development of biomass fuel and products in the context of economically-viable production systems.

If it is possible, this legislation would also be strengthened by clarifying that producers and processors would be eligible to receive research tax credits for exploring the development of these new systems.

We concur with the value and need for expanded research in areas identified by the bill and recommend some additional areas that need to be addressed.

The recent National Academy of Science Report, the President's Council on Science and Technology, and, indeed, the legislative language of this bill provide an excellent listing of the critical topics in the arena of biomass production and processing that need additional research.

We strongly endorse the issue areas identified in this bill, and we would like to suggest several additional areas of research to be identified in this legislation.

We note that some industry groups have suggested, in addition to cellulose breakdown, that research is also needed on developing better catalysts and separation processor. As well, industry and processes have suggested that additional research is needed in the area of developing alternative uses for plant remains and the byproducts of biofuel production.

We concur with each of these recommendations.

I would like to elaborate on Mr. Reicher's comments regarding sugarcane residues, and I would like to elaborate on it because of the potential it has for more rapid progress in the future, with respect to ethanol in particular, than we have had in the past.

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This particular technology is due to a breakthrough in molecular biology, which really enabled more rapid progress in reducing the cost of a biofuel, ethanol. U.S. Patent No. 5,000,000 issued to the University of Florida covered movement of a gene from a bacteria that has not been used in ethanol production into bacteria *Escherechia coli* that are used in ethanol production, so that this microbe could then metabolize five-carbon sugars as well as six-carbon sugars, and so this makes for a more efficient process, and this is the basis of the plant being built in Louisiana.

The whole arena of molecular biology has huge potential to make possible more rapid progress in the future. We note that some environmental groups have called for additional research on the environmental consequences of producing, processing, and using biomass for fuel in industrial processes. We concur.

We also note that some farm groups have suggested that support for corn-based products and grass-based products be managed so that both are supported and advanced, rather than becoming competitive efforts. We concur with this.

Lastly, we suggest that additional language be provided that clarifies the need to work on biobased fuels and products in an integrated systems approach with adequate support for economic and market research to support the development of new technologies, processes, and products.

We recommend adding a capacity to address education and extension needs as part of a comprehensive approach. It is not sufficient for research to develop new biomass crops and more cost-efficient production technologies. This research needs to be communicated to producers and processors. If production and processing problems emerge, this needs to be communicated back from the field to the scientist. If novel partnerships between producers and processors are necessary to develop economically-successful biomass production systems, someone needs to be charged to act as a social catalyst, creating the opportunity for the various actors to meet and develop joint ventures.

Our land grant system is unique in that it combines the need to address research and extension together to apply science to real-world problems.

Mr. Chairman, how am I doing on time.

Mr. LAHOOD [presiding]. If you could conclude, it would be marvelous.

Mr. JONES. Thank you.

We support innovative, multi-agency collaboration. We recommend clarifying the proposed language on funding mechanisms to ensure that the intent of the bill is realized. And this legislation does an excellent job of stating Department of Energy and Department of Agriculture need to coordinate and collaborate, and we would like to emphasize that this be done.

We recommend building on the unique Federal/State/local partnership built into the land grant system. In addition to the unique partnership between research, extension, and education built in the land grant university system, we are also unique in that we are simultaneously engaging our Federal, State, and local partnerships, and we would like to emphasize or request that the legislation address and take advantage of this unique relationship.

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Lastly, we commend this committee for its leadership in bringing this important legislation forward, and at the appropriate moment I would be happy to respond to any questions.

Thank you, Mr. Chairman and committee.

[The prepared statement of Mr. Jones appears at the conclusion of the hearing.]

Mr. LAHOOD. Thank you, Mr. Jones. Welcome, Doug.

STATEMENT OF DOUGLAS A. WILSON, PRESIDENT, ILLINOIS CORN GROWERS ASSOCIATION, ON BEHALF OF THE NATIONAL CORN GROWERS ASSOCIATION

Mr. WILSON. Thank you, Mr. Chairman and members of the committee. I am Doug Wilson, a corn and soybean grower from Gridley, IL, and I am president of the Illinois Corn Growers Association.

I am testifying today on behalf of the National Corn Growers Association. I want to thank you for this opportunity to appear before you today and present NCGA's views on H.R. 2827, the National Sustainable Fuels and Chemicals Act of 1999.

I will summarize my statement and ask that the entire statement be included in the record.

Mr. Chairman, increased population, now at 6 billion, coupled with rising demand for consumer products and finite fossil fuels will require us to develop renewable resources to supplement petroleum. Renewable materials from U.S.-grown crops, trees, and agricultural waste can provide us with fuel and many of the same basic chemical building blocks as petroleum.

Using historical average prices for corn and oil, the cost of carbon from corn approaches the cost of carbon from oil.

If we are to fully realize the potential for biobased resources as a supplement to fossil fuels, we must begin to be laying the research foundation today. We will need new routes for more-efficient processing and utilization, as well as a whole range of plant-derived building blocks.

When we talk about biobased products, most people believe that corn growers are only interested in ethanol. Renewable feedstocks derived from plant-based materials provide an opportunity to meet growing demand for chemicals in the U.S. and throughout the world.

The current U.S. chemical industry uses about 900 million barrels of oil annually to produce organic chemicals. That is equivalent to about 12 to 14 percent of the total U.S. oil consumption. The demand for chemicals is expected to continue to increase as population expands and alternatives are needed to meet this increased demand.

The most significant opportunity to help offset the need for additional oil consumption for chemical production is the use of alternative feedstocks that can be derived from renewable plants and crops. These may include traditional crops such as corn, soybeans, wheat, and new crops, such as switchgrass and fast-growing poplars, or plant residues.

In 1996, the U.S. agricultural, forestry, and chemical communities began working with the Department of Energy to develop a long-term strategy to increase the utilization of renewable input.

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In the 1998 commodity classic, the unique, broad-based coalition unveiled a long-term strategic plan called "The Crop-based Renewable Resources 2020." The renewable's vision is aimed at significantly increasing the use of crops, trees, and agricultural waste as industrial feedstocks. The principal goal of the renewable's vision is to produce 10 percent of the basic chemical building blocks from renewable sources by the year 2020 and 50 percent by the year 2050.

A technology roadmap was published earlier this year that identifies performance goals and establishes a focused research and development agenda. The technology roadmap identified research needs in four major areas: plant science, production, processing, and utilization.

I ask that a copy of the vision and the technology roadmap be included in the hearing, and I'd ask the clerk to pick those up afterwards for the hearing record.

We believe that the technology roadmap can and should serve as a solid foundation for establishing funding priorities.

In addition to our interest in using plants for basic chemical building blocks, we are also interested in additional research on biobased fuels. As a corn producer, I would like to thank you and the many members of this committee for the strong support that you have shown for ethanol. Your work and attention, however, are still needed.

You know, Mr. Chairman, how important ethanol is to corn growers. Today we use 550 million bushels of corn to produce ethanol. We believe we must have strategic partnerships to enhance research and development of the new ethanol technologies that also build a bridge to the biobased chemical industry.

One significant component of this efforts should be a corn processing research pilot plant. A pilot plant would facilitate and transfer the acceptance of new technologies and innovations in grain processing for fuel and chemicals.

The pilot plant would allow small corn processors to band together and form partnerships to pursue the development and commercialization of new technologies that will improve corn processing.

We are pleased that an authorization for the pilot plant is included in this legislation.

It is important to point out that the benefits of this facility extend beyond corn. With plug-in technology for different research projects this facility will have, improvements in corn utilization and fermentation, separation technology, and other advances could be applied to other renewable fuel sources.

Mr. Chairman, we believe H.R. 2827 provides a great step forward in establishing a framework that can help us achieve a biobased economy. Plant-based resources are available in several forms—wood, cellulose, lichen, starch, oil, amino acid, et cetera—and may come from different sources, including crops such as corn, soybeans, wheat, and other forms of biomass such as crop residues.

Processes and technologies will need to be developed that can support this broad base of feedstocks and not be limited to cellulosic.

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The corn, soybeans, and other plants will continue to play an essential role in providing research and industrial feedstocks far into the future. By addressing research needs in broad-based feedstocks, H.R. 2827 can help us achieve biobased economy.

We applaud your leadership in this effort and look forward to working with you to gain enactment of H.R. 2827.

I want to thank you for the opportunity to testify, and also I'd be happy to answer any questions at the appropriate time.

[The prepared statement of Mr. Wilson appears at the conclusion of the hearing.]

Mr. LAHOOD. Thank you, Mr. Wilson.

Mr. Yost.

STATEMENT OF MIKE YOST, CHAIRMAN, AMERICAN SOYBEAN ASSOCIATION

Mr. YOST. Good morning. On behalf of the American Soybean Association, I'd like to thank the subcommittee for holding this hearing, and especially thank Mr. Ewing for his leadership in this area.

For years, soybeans have been called the miracle crop because they have been used for so many things. Its most prominent use is a source of protein in both feed for animals and food for people; however, the soybean and its two major components, oil and protein, have many industrial uses.

Soybean producers across the country have invested millions of dollars of funds through the national check-off program in developing and promoting soybeans and soy-based products. A portion of those funds have been directed to industrial uses.

Many years ago, producers realized that soybeans were a versatile commodity. With a very competitive world market, soybean growers have realized we need to expand the utilization of soybeans beyond traditional uses.

The chairman is aware of this investment and has been supportive of our many initiatives. During the last session of Congress, several members of this subcommittee were original cosponsors of legislation to promote the use of biodiesel and biodiesel blends in Federal markets. We thank you for your support.

As a direct result of last year's legislation, USDA has announced that the agency will purchase and use 20,000 gallons of biodiesel, and, in fact, the ARS lab in Beltsville, MD, began using B–20 in 65 vehicles last August.

I am pleased to point out that Governor Taft of Ohio has announced that his State will use 400,000 gallons of biodiesel over the next year.

As you can see by these two significant commitments to using biodiesel, we are finally starting to see some progress in this infant industry.

Of course, we are far behind our friends in Europe, who have encouraged the development and use of bioenergy, including biodiesel, for many years. The result of the EU's investment is a viable bioenergy industry.

Our association hopes legislation like yours and its companion bill in the Senate will focus attention and resources to further development of the technology needed to advance the use of biodiesel in the United States. We are concerned that without this support

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biodiesel will continue to be plagued by policies that hinder rather than encourage its use.

Biodiesel and also soy ink are presently the most visible and commercially successful soy-base industrial products; however, they are by no means the only two available in the marketplace.

Also available for commercial purchase and use are soy-based lubricants, adhesives, plastics, particle boards, detergents, solvents, and the list goes on and on.

While there is certainly private investment in all of these products, there also needs to be a public investment by the Federal Government.

These products are usually more environmentally-friendly than their petroleum-based competitors, they are derived from renewable resources, and they help provide new markets for commodities such as soybeans, which, in turn, helps farmers and the economy of rural communities.

However, the technologies are new and emerging and are often expensive. As soybean growers have learned with biodiesel, having good products is sometimes not enough. Production and marketing are costly and complicated. More study and data is needed to help streamline processes to help get products into the marketplace in a timely and competitive manner.

The Federal Government can help provide both the financial resources and the expertise needed to bring products to the market. Just an example of a need for more Federal assistance: last year, the DOE budget for biodiesel research through the National Renewable Energy Laboratory was only $750,000, and the USDA biodiesel research budget through the Agricultural Research Service was less than a million dollars.

In comparison, soybean growers have invested over $20 million of farmer dollars over the last 6 years in biodiesel development.

Soybean growers, and, to a lesser extent, the biodiesel commercial industry, are providing the largest share of investment in biodiesel; however, there is a need for public research.

We hope your legislation will serve as a catalyst for encouraging Federal investment, not only in biodiesel but in all industrial products.

The Sustainable Fuels and Chemical Board established in your legislation will build a stronger partnership between Federal agencies that will improve communication and coordination.

Presently, many agencies are not even aware of how they can contribute to the development and procurement of biobased products. The Board can help focus all relevant agencies on this agenda, and hopefully become the clearinghouse for information and available resources.

We also applaud your decision to include the authorization of an ethanol research pilot plant. We'd like to see the subcommittee also consider including the authorization for a biodiesel project aimed at reducing cost of soy-based biodiesel.

Mr. Chairman, as a soybean producer, yourself, I know you are aware that soybean acreage is up and prices are down. If we are going to impact immediate success of soybean producers, now is the time for the investment in new markets and new uses of soybeans.

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Again, the members of the American Soybean Association commend you, Mr. Chairman, for your continued support. You are a true friend of the soybean growers and we appreciate your leadership.

Thank you

[The prepared statement of Mr. Yost appears at the conclusion of the hearing.].

Mr. EWING [presiding]. Thank you, Mr. Yost.

Mr. Desrochers.

STATEMENT OF PAUL E. DESROCHERS, DIRECTOR OF FUEL PROCUREMENT, THERMO ECOTEK CORPORATION, ACCOMPANIED BY PETER H. WEINER, COUNSEL

Mr. DESROCHERS. Good morning.

Chairman Ewing, Representative Condit, and subcommittee members, I appreciate the opportunity to come before this subcommittee to support H.R. 2827 and discuss the issues facing the existing biomass-to-energy conversion facilities.

My name is Paul Desrochers, and I am the director of biomass fuel procurement for Thermo Ecotek. Our company operates biomass energy facilities, not only in California but also in New Hampshire and the State of Maine.

Beside me is our counsel, Mr. Peter Weiner.

Our testimony represents the existing operating biomass-to-energy facilities in the United States. We would like to make the committee aware that the existing biomass industry is in peril due to the energy deregulation.

The existing infrastructure that we represent is required in order to continue to provide the substantial environmental benefits that our industry currently provides, as well as a platform that is necessary for commercial research and development of the new biomass energy development that we are currently discussing in this bill.

In California, our facilities are located in the vast agricultural region of the State, the Central Valley, which generates the majority of our biomass fuels. Our facilities utilize in excess of a million tons of agricultural waste on an annual basis. Those wastes include not only prunings, but peach pits, olive pits, almond shell, almond hulls, a variety of food product waste that have no other alternative.

Our biomass-to-energy electricity power plant converts waste, biomass fuels into electricity through controlled combustion, utilizing state-of-the-art emission controls. In fact, our facilities all rated back best available control technology, and were when they were permitted and are today.

The biomass industry in California started in mid to late 1980's with the passage of PURPA, State-mandated power purchase agreements with utilities. These contracts provided a safe haven economically for 10 years, after which energy prices were projected to increase sufficiently to allow for the transition into the free energy market, which would pay for the collection, processing, and transportation of agricultural waste fuels.

As we are aware, that didn't happen. The deregulation of the electrical industry and current market prices for energy have made

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it difficult to operate these facilities utilizing the same fuel mix. Price only competition—that is, the price for energy—unreasonably fails to attribute a fair value to the demonstrable, non-electric benefits enjoyed by the public as an inherent component to this technology, primarily air quality benefits.

One of the facilities that I represent is the Delano Energy Company. It is a 50 megawatt biomass facility located in Delano in Kern County, just 30 miles north of Bakersfield. This is the largest biomass power plant in California, generating power for approximately 45,000 homes. Delano is located in the heart of the almond, walnut, and citrus industry, and our facility currently consumes in excess of 300,000 tons of orchard waste materials.

If this facility was not operating or accepting this biomass fuel, these materials would be burned in the open, because there is no other alternative for disposal, further deteriorating the air quality in the Central Valley.

Delano is located in the San Joaquin air pollution control district, which is currently designated serious, nonattainment for PM–10 and nonattainment for ozone.

If the facility does not continue to exist, providing a reduction of emissions, an additional 5,500 tons of pollutants annually would go into the airshed. If those tons of pollutants were valued based on a permanent emission offset, they would be valued to the State of California around $7 million.

The dilemma facing facilities like Delano is that the current market rates for energy are so low that the environmental benefits are in serious jeopardy.

Most renewable technologies like the biomass industry are working hard for transition by lowering its cost; however, it will be a challenge to compete against larger natural gas-fired power plants on the energy price, alone.

The key to successfully retaining these non-electric benefits of biomass-to-energy facilities is to assist the transitioning of facilities like Delano to be able to compete in the open market. If not, we should expect the following to happen:

Erosion of the biomass-to-energy production capacity.

A substantial loss in the collection, processing, and transportation infrastructure that we are going to need to expand into ethanol and biochemicals.

A halt in technological innovation.

The loss of support from the investment community for any new biomass development. I think that's a real critical risk.

The loss of technical and management talent.

The loss of substantial environmental and economic benefits, including the high levels of rural employment that our industry provides in the Central Valley of California.

Recently, much has been said about proposals to expand the biomass industry. It is important to realize that the infrastructure to collect and process wood waste for biomass-to-power industry is the same that would support the new end uses of biomass that we are talking about today.

I am here to support your efforts to pass legislation that could help the biomass-to-energy industry continue to provide significant environmental benefits. We would welcome the opportunity to de-

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velop a demonstration project that would confirm the environmental benefits of biomass to energy in the Central Valley of California and assist in developing technologies that can help facilities like Delano Energy compete in a deregulated energy market.

Thank you again for the opportunity.

Mr. EWING. Gentleman, as you hear the bells ringing, that's always not very fortunate when we have a panel right in the middle, so we have completed the testimony, and I would ask you to relax for about 10 minutes. We will go over and vote. This is a small bill, just funding the Government for the next week, but kind of important.

We will be back, some of us, and we will finish and get into the questions.

I appreciate your indulgence. We will be in recess for about 10 minutes.

[Recess.]

Mr. EWING. Thank you for waiting while we did our vote, and we will go into the questioning here.

Our two university representatives, I'd like to talk a little more about the different products or the different things that you use in your research.

Would it be accurate to say that corn and soybeans would benefit from that research quite a bit, Mr. Holt and Mr. Jones?

Mr. HOLT. Definitely. Of course, from our midwestern perspective, that's a very important dimension in this bill, and, again, I think I'd echo what some of the others said, that there is such a wide spectrum of potential products from corn and soybeans, and that's an important thing to look at.

Mr. EWING. Those products are greater than just what we might be making from the biomass from the waste of other crops, including corn and soybeans?

Mr. HOLT. Yes, and I think an important dimension of that is that some of these things would compete in what you might call commodity markets. You know, gasoline is a commodity, and so if you compete in that market you are sort of back into the commodity situation.

So some of the possibilities are to produce unique sorts of differentiated products that may have, you know, somewhat thinner markets, but, nevertheless, provide for some diversity, give some opportunities for some people, at least, to diversify their operations and to get into arenas that perhaps might not be quite as competitive as the commodity markets.

Mr. EWING. Mr. Jones, they grow a lot of wonderful crops in the south. I know you grow corn, and, to some degree, maybe soybeans in Florida, but you grow most of our seed corn, I think, or a good part of it on the off season is grown down in Florida. But what are the potentials from cotton, rice, citrus, sugarcane, peanuts, even tobacco?

Mr. JONES. Yes. Mr. Chairman, I think, to follow up Dr. Holt's comments, I think that we have a lot of potential there in all of these crops, particularly with the residues and the waste.

As we mentioned earlier, there is the sugarcane project in place to deal with sugarcane bagasse, and there is a lot of potential there. There's a lot of potential even in Florida. We have a lot of

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animal waste to deal with, and to be able to develop economically viable methane production systems from that waste will be very helpful.

Additionally, another aspect is that we are rapidly becoming able to develop plants that will produce products that they don't normally produce, that we wish them to produce, so that we can have plants that are produced for biofuels, but at the same time produce byproducts that would be very economically important.

So I think there is lots of potential for any number of crops, especially from the residue standpoint.

Mr. EWING. Could you also comment on the impact on the production of food and fiber that you might see from large-scale development of biobased products?

Mr. JONES. I don't think this would have a negative consequence on food and fiber production, itself, because, as Mr. Holt just mentioned, if we are not careful in terms of biofuels, this could become more of a commodity thing, and the food and fiber aspects of it would have more value.

So I don't see it as a negative, and that is—in Florida, for example, I don't see that we would be real big in producing crops specifically for biofuels—perhaps some grasses in some of our range land, and perhaps some in the corn and soybean area of north Florida, mostly—because of land values. Most of Florida agriculture will continue to be committed to high-value winter vegetables and things of that nature.

Mr. EWING. Mr. Holt, I mentioned earlier about whether there is a concern about taking the residue. And I make a distinction between residue and waste. When we get what is left from our combines in a corn field, we'd consider that pretty much residue and not waste—and my question about the impact on conservation practices.

Mr. HOLT. That's certainly an important question, and it is a researchable question. I wouldn't say that I have the answer to it right at the tip of my tongue, but, needless to say, there would be a lot of different situations where it would play into a decision as to how much or whether all of the residue could appropriately be removed, and in an erosion situation, if it was steep fields that were quite erodible, naturally you need to leave more protection there. Maybe in some of our level fields in central Illinois you could leave less residue.

The other aspect of this that I think is very important—and you mentioned this, in part—it is likely that there is going to be both food and chemical feedstock products produced from the same crops simultaneously, more or less, and I think the biotechnology revolution is certainly going to contribute to this, in that you can have the corn crop, for example, producing a certain constituent, or the soybean crop, for that matter. Now, the soybean crop, among other things, produces vitamin E, but, needless to say, it's not all vitamin E, so there are a lot of other things there that are being used for other purposes.

So that's what I see as the future, that is, the processing of the grain and perhaps some portion of the Stover into several different products, and some of these will be food, some will be chemical feedstocks, some might be renewable fuels, and that complicates

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the research challenge and the economic challenge of putting together those systems, but that, to me, is the challenge that we have to meet.

Mr. EWING. So you see biotechnology as being a big factor in helping us get to crops that we can get more and more things out of?

Mr. HOLT. I think that is a critically important factor, and particularly with the development of genomics. We are essentially moving toward a situation where you could engineer a plant or an animal or a microbe to produce virtually any organic chemical in some kind of an industrial process. So I think there are just unlimited opportunities, and the big problem would be selecting where is the best place to make the investments.

Mr. EWING. Doug, what is your comment, and maybe take that with you and Mr. Yost together, on the waste angle or the residue angle?

I heard of a development a few years ago where they were making contracts to buy the residue of our corn crop. I don't know where they actually made those contracts. The one that talked to me about it I don't think ever developed. And what were they doing with that waste at that time?

Mr. WILSON. Well, Chairman Ewing, at that time there was the discussion of using corn Stover to make paper, when the price of wood pulp was getting to be fairly high they were looking at other alternatives. At that point in time, the Illinois Corn Growers did look at the feasibility of that, and so I make fairly comfortable in making a few comments about removing residue from a corn field, the situation being that there's not only the conservation aspects of it, but the productivity of the land as far as the organic material, because we do, in central Illinois, have a very high organic type of soil and the residue that goes back into the soil to keep that in balance.

I believe I would be safe in saying that you could potentially take 20 to 40 percent of the residue off. It couldn't be on a continual basis, but you could remove a percentage of the residue. It could be utilized for those types of products.

Just as a comment, kind of away from your question, it is interesting for me, as we welcome new types of energy possibilities from different forms of renewable fuels, that the structure that has made everyone else's opportunity possible comes from corn-to-ethanol research, and so I think that the foundation that we are building off of and the foundation that will be part of this overall project, it really speaks very well about yourself and others who have worked to further ethanol.

If you go back to the saying, "What brought you to the dance," this is what brought you to the dance, corn to ethanol. So we are looking to expand more markets, and we think this has a good future. Yes, we will try to put some corn stalks into the biomass, as well.

Mr. YOST. Just to expand on Doug's comments for a moment, there is a firm, I believe in Minnesota, that has done some work on using soybean residue to make particle board. I don't know the current status of that. I suspect, because of conservation issues and the small amount of crop residue from soybeans, that most of the

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alternative biomass work on soybeans will be done from the seed, itself.

Mr. EWING. Mr. Desrochers, you, I think, laid out some of the problems in your industry today. Do you have a long-range projection? Do you see this as a viable source for the energy industry?

Mr. DESROCHERS. Long-term, yes. We believe that energy prices are going to continue to increase over time, primarily in California with the increased demand for energy. The issue we have is the bridge of getting us from point A to point B when we think energy prices will go up.

Mr. EWING. And what is that bridge?

Mr. DESROCHERS. In California, primarily, we are looking at—we think we have got an annual problem that is in excess of $10 million in order to bridge until energy prices are able to escalate to meet our operating cost.

We believe that the benefit that we provide to the people that breathe air in California, because we do significantly reduce emissions and we do reduce materials going in to landfills. Prior to energy deregulation, that benefit was paid for by the energy rate payer. In other words, we were getting a rate that met the cost of collection, processing, and transportation of these agriculture residues, agriculture waste. In deregulation, obviously, we are part of the free market.

So what we are looking at is we can substantiate the value by reduced air emissions and reduced material going into landfills to make that bridge, so we see it as, you know, that there is—it's just how do we shift the cost of disposing of this material from the energy rate payer, which is happening as we speak, to the benefitters of those environmental benefits, and that's the puzzle.

Mr. WEINER. Chairman Ewing if I may just add to that, the San Joaquin and Central Valley in California is a unique area, as many people know. You can see it from outer space, it's that defined a valley. But it has very significant air problems.

Because of urban growth in the valley and because of inter-district transport of air pollutants from the San Francisco Bay area, we have significant problems in that valley. They are not all caused by agricultural burning, but we have those problems.

Under the Clean Air Act, people who are new sources of emissions—if we want new factories, new jobs, new residences in that area, those folks have to offset their emissions, so we can quantify what it costs per ton of pollutant when you need to purchase offsets in order to have new jobs.

So we know that we provide a value of about $92 million a year that costs $10 million. It's a heck of a rate of return, if you are investing. But someone has got to pay that bill.

In the past, as Mr. Desrochers said, the rate payer paid that. With PURPA's subsidies ending, there is no public payment for that public benefit. The result is that farmers can't afford to pay that price at the moment to take their orchard removals or prunings to a biomass facility, because to chip it and transport it may cost them $30 per ton, and the biomass facilities, who are no longer getting a subsidy, can't pay it.

The result is that the farmer is likely to burn the waste in the open field, the biomass facility either shuts down or goes to other,

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cheaper sources of fuel like urban wood waste, like broken pallets or green waste, and so on.

So we have a real possibility of losing the infrastructure of collecting that biomass waste if we can't bridge that gap of where we have a public benefit but we don't have anybody in the public to pay for it.

Thank you.

Mr. EWING. Doug—and to you, too, Mr. Yost—it probably was more impacted by corn than soybeans, but maybe that's just my perception.

I can remember back when corn was worth more than it is today, and we were all smiling a little more, but it created problems for the ethanol industry. I remember talking to the folks from ADM when corn was—I don't want to say a price, but I think it was $3 to $4 a bushel, and they were saying, "We can't make ethanol with corn at that price."

That's a dilemma that maybe doesn't impact the biowaste, but it certainly impacts the corn industry and the ethanol industry.

Do you have any comments about how we take the valleys out of it and how they can afford to make all the ethanol they want from $1.74 corn?

Mr. WILSON. You are exactly right, and, of course, obviously, we are not real thrilled with $1.74.

I think the real key to that lies within the efficiencies of how the ethanol is utilized, how they produce the ethanol.

I think the other real key is what other products can be utilized from the that kernel of corn. Corn, of course, we know has a high value. They talk about all the other processes. As you know, the Decatur plant, I think, between their corn and soybean operations is probably making between 25 and 30 different products.

And so, as they keep moving and developing more uses and more opportunities, that then, dare I say, makes ethanol become a by-product. And so if you can take your total value of what you get when you buy that bushel of corn, as opposed to all the other benefits that you receive from that, that's really where the key lies, and that's where something like this really brings us along the way—the research, the development to improve the technologies of ethanol. But, in the same regard, those oftentimes lead to additional benefits and to other areas of usefulness.

Mr. EWING. Mr. Yost, do you have a comment on that?

Mr. YOST. Just a couple brief comments, Mr. Chairman.

First of all, part of the problem with biodiesel is quantity. We need to get our volume up.

When I first got involved as a member of the National Biodiesel Board and we were doing demonstrations, including the one in town and shipping our product by 55-gallon barrel, the costs were $4 to $5 a gallon. Recently, the cost of biodiesel is down to $2.50 a gallon, and I am talking about neat biodiesel.

So one of the things we need in our industry is more volume. It's kind of a chicken and egg concept. As soon as we develop the market, we will have more players, more competition, more volume.

The second thing we need to do is continue to strive, similar to the ethanol industry, to find out a way to manufacture biodiesel at

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a lower cost of production and use other waste products to bring down the price of the soy-based product.

Mr. EWING. In a related area, I have a constituent who has approached me several times on an idea of using energy credits for growing legumes on land that may not be as suitable for cropping purposes, and, because it takes carbon monoxide out of the air, and then even using the legumes, themselves, for a biomass type production of energy or ethanol or whatever it might be. Do any of you know of any research in that area or have any comments in regard to that as a viable alternative, and also one that might provide some income for property owners and farmers?

Mr. Yost, you are the brave one.

Mr. YOST. Well, there has been a project in Minnesota that has been a combination of projects between Northern States Power and a farmer-owned cooperative to grow alfalfa for biomass and bioenergy. It has had some stumbling blocks and hasn't done particularly well right now, for a variety of reasons.

I think the concept is great, but it is going to take a fair amount of subsidy, and I think it is going to take a willing private sector party to be involved in it.

I know there were several acres of alfalfa produced for that plant, but it hasn't been up and going yet.

Mr. EWING. Dr. Holt?

Mr. HOLT. I might just mention, and this as stretching your question a little bit, that one of the energy costs of producing ethanol, one of the big costs, actually, is the energy required to produce nitrogen fertilizer, and, needless to say, there is quit a bit of research, very much in the early stages, basic research now, in attempts to give other species besides legumes, the ability to fix nitrogen. That, of course, would be a really revolutionary contribution and it would reduce the cost a lot of producing various renewable fuels and chemical feedstocks.

Mr. EWING. Would you expand on that just a moment now and explain it just a little more?

Mr. HOLT. Corn, for example, as the major raw material for producing ethanol, requires considerable amounts of nitrogen fertilizer, and that requires energy to produce. Anhydrous ammonia is essentially made in an electric process, quite heavily an energy-requiring process.

I know years ago, when we used to do energy budgets, and back at the time when there was, obviously, more energy going into producing ethanol than you could get out of it, one of the big costs was the cost of energy required to produce nitrogen fertilizer.

So legumes, on the other hand, don't need nitrogen fertilizer because they fix their own nitrogen through the action of the bacteria in the nodules on the roots.

The biological holy grail has been to try to find out how you could encourage corn to do the same thing. And that's not out of the realm of possibility, and I think the genomics opens that possibility because, prior to the time of genomics, scientists would spend their whole career trying to figure out how one gene functioned and maybe learn how to transfer it, whereas now, in genomics, you can look at a whole group of genes, and that's what is going to have to happen in order for corn and other non-leguminous crops to fix

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nitrogen—there's going to have to be a transfer of several genes and all the related promoters and so on that will make the genes work in that new genetic environment.

So I think that's a great possibility. That's very much in the basic stages. We have to learn what is that complement of genes that enables plants to enter into the symbiotic relationship with bacteria that form nitrogen, et cetera.

Mr. EWING. That's an excellent example, and biotechnology and that research—this is a question, I assume, in my opinion, that has tremendous potential for the development of many things that could be used to manufacture and to make energy sources and all manner of things. Does anybody else have a comment on that?

Mr. JONES. Yes, Mr. Chairman. I would just add that I agree with you that the advent of biotechnology is going to enable things that we haven't even imagined in the past, and Dr. Holt gives a good example with the possibility of having corn to be able to fix nitrogen, or any other plant that doesn't do it. That would be a tremendous advantage and cost savings in production.

To the first part of your question, I would add that I think it is important that, as this program develops, that it be integrated with other USDA programs, including conservation reserve, and how, if a farmer or any landowner is putting property into conservation reserve, how that may be able to contribute to the production of biomass for biofuels, or whatever, because 30 or 40 years down the road, if we are really producing most of our energy from biomass, then we are going to have to have tremendous amounts of land in production of biomass in an environmentally-sustainable way, and that would include the types of things you just mentioned.

You mentioned energy credits. I think tax credits would be important to get farmers and producers involved in the early stages of this if they are doing demonstration plots or research plots, that they would be allowed to get a credit for that so to encourage that, to speed the process along.

Thank you.

Mr. EWING. A final question to our commodity people. Do you see this as a real income enhancer for your producers, or is it going to be more in the areas of waste, like that come from orchards and forests and other things besides rural crops?

Mr. YOST. We definitely see this as a very viable part of our income. Soybeans are crushed primarily for the protein component right now. We have a serious competitive in palm oil in southeast Asia that's a low-cost competitor. We need an alternative use for the vegetable oil component of the soybean, a new use.

We have 7 percent of the domestic human consumption market in this country. We need a new industrial use, so it is vital that we get the biodiesel industry up and going.

Mr. EWING. Thank you.

Mr. Wilson.

Mr. WILSON. Yes. I would say that, obviously, we see benefits to corn producers, as well, and I believe probably Mr. Yost and I share that we grow both corn and soybeans close to 50/50, so obviously we have interest.

But I think, as more and more biotechnologies come on line, as more and more renewables come on line, you look at the future, the

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replacement of the chemical-based petroleum products I talked about in my portion of the testimony—you know, 12 to 14 percent of the oil consumption goes to chemical production that then turns into other products.

So I think there is a lot of an area that has not yet been tapped, and I think we have additional ways, and I agree with you that biotechnology, we are just scratching the surface, and I think there are more and more things to come, and more and more defining, and, of course, our goal is to make sure that farmers share in that increased value in our products.

Mr. EWING. Fine. Thank you.

Mr. Smith.

Mr. SMITH. Well, just a comment maybe on the biotechnology and, of course, the arrabadopsis thileana that they had planned on finishing the cataloging, gene cataloging, I think originally in 2007 is going to be completed next year, and so I agree with you, it just opens the door even wider for the new gene technology, except the challenge that is facing—and maybe, Mr. Holt and Mr. Jones, I'd get your reaction—and, of course, the commodity organizations, too, as we are now seeing some of the activists that I refer to as "extremists" in Europe who have significant suspicion of not only their regulatory agencies and their scientific community, but also new gene technology, has tremendously slowed that down and, of course, is inhibiting our exports into their countries, using that as an excuse.

I chair the Basic Research Subcommittee in the Science Committee, and we have been doing a series of hearings—the next hearing is this afternoon at 2 p.m.—on the whole geno-process, from the lab to the field to the market.

I guess one of the significant challenges is the scare tactics that can be used on the gene technology. So if you have any comments or suggestions, I'd certainly invite all of you to—this is our third hearing so far on gene technology in our Research Subcommittee.

Mr. JONES. Yes, Mr. Chairman and Mr. Smith, I would like to comment on that.

As you indicated, you are aware that in Europe this concern about GMOs, as they are referred to, although we are going to try stop using that term and come up with something else, I guess, but it is being used in Europe to protect the family farm. There are concerns that, as we move into a more biotechnology-oriented agriculture, that the corporate entities will take over, so it has been used from that perspective. As you said, it is being used as a trade barrier also.

I think in the United States we need to try to get people to focus on the product and not the methodology. And so what is it that is being produced? And if labeling is necessary, in my view, that's good. We can say what's in that material.

Mr. SMITH. Well, just to interrupt you, I am taking a bill to my committee hearing this afternoon that says that all genetically-modified—all fruits and vegetables and grain products, as well as nut products, that have not been genetically modified need to be so labeled. And I am doing that simply to make a point that almost every food product that we eat has been genetically modified, traditionally through cross-breeding, where thousands of genes are in-

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corporated into another plant not having any idea or very little idea what some of the ramifications of some of those genes may be.

Mr. JONES. Mr. Smith, obviously you have a full grasp of this, so I don't know if I can add a lot more to it.

Mr. SMITH. If the organizations that you have an influence on sitting at this table would start a coalition of information, somehow we have got to have a marketing strategy. The American people, the world, Europe, has somehow got to have better communications, and that's where I am going to hit some of our regulatory agencies up this afternoon is our communication has been very lacking, it seems to me.

Mr. Holt, did you have a comment?

Mr. JONES. May I say one thing, before I turn it over?

Mr. SMITH. Sure. Excuse me, Mr. Jones.

Mr. JONES. One point I wanted to make that you hit just at the last is the concern about the EPA and the FDA. When the whole thing came out about the monarch butterfly, those agencies should have stepped up and spoken up that these materials had been fully tested and been approved and been through the process and all of that, had been evaluated, and, to my knowledge, it is just stone silence here with regard to those issues, and I think we should have those agencies speaking up more.

Thank you.

Mr. HOLT. I will just mention that we, obviously, have been quite concerned about this within our institution and within Illinois and have tried to devise a strategy.

One of the things we have concluded is that this is probably a greater short-term problem than it is a long-term problem. Maybe that's naive, but, you know, in my experience, at least, eventually reason prevails and the truth comes out, to a certain extent, and I think we will find that the dangers associated with genetically-modified organisms are greatly outweighed by the potential, and that the changes are not all that much different than the kinds of changes we made in the past, and eventually that information will be fairly widely accepted.

It is somewhat unfortunate that the first developments that came out and got a lot of publicity were production traits, rather than utilization traits. I suspect the European consumers don't really care how much money is saved by American farmers in use of pesticides and things like that, but they would be a lot more reluctant, I believe, to turn down new products that reduce their chance of cancer and high blood pressure.

Mr. SMITH. That's a good point.

If I can just add one more question, Mr. Chairman, the propensity of the research with the stimulation of making more money from the seed companies, et cetera, the propensity to do more genetic research in terms of increasing productivity encouraged by the commodity organizations, maybe rather than something that is easier to explain and sell, such as increasing the nutritious nature of that food or increasing the health values of those food products, might be easier to sell at a time of all this abundance.

As our chairman said at one time with this whole gene technology, some years of very short production, where there was a greater need for productivity and production, might encourage the

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other realm of gene research and a more-realistic view from Europe.

Should we look at increasing our Federal dollar emphasis to the kind of gene research that is going to add to the health of consumers, rather than the productivity of the commodity?

Mr. HOLT. Well, productivity will continue to be important, because there will always be competition and there will always be the need to keep the cost of these operations low, so it is not really one or the other. And that's sort of what I emphasize in my testimony, that you have to look at these potentials in the context of the total process and all the various dimensions of it, including the public perceptions.

One of the things that I have noticed is that if you think about the fact that people vote or express their political views, they do that in various ways, and when they get the opportunity to vote in various forms and so on, but sometimes when they go in the grocery store—which is another way of voting—they seem to vote differently, and they really get down to quality and price. I think that that's where it will eventually sort out.

We see our biggest problem as, as I said, a short-term problem. Right now we are having trouble answering the question for farmers, you know, "Should I plant round-up ready or Bt crops this coming year?" That's the one that is hard, because we don't know how long what we think is basically a prejudice is going to have an influence on the market.

Mr. WILSON. If I may, I will step in just a little bit from a farmer's perspective and from a commodity organization.

We have tried to be as engaged as we can. Of course, this spring we had the, "know what you grow" campaign, where we tried to identify the approved and non-approved GMOs.

As we went through the summer, in early September we had the announcements from ADM and other companies about wanting to have more segregation because they had some customers that didn't want any GMOs.

I think farmers fully have realized the benefits in the early stages. I think you are entirely right. But I think you have seen a shift from when the early developments of biotechnologies came on from how can we grow more, which has been a philosophy, to more value-added now.

I would be quite happy to grow something with a pharmaceutical base that may only yield 70 bushel an acre if, indeed, the price would then reflect what the true value of that is. And so, in theory, if I grow 70 bushel, they could pay me $8, $9, $10 a bushel, something that would reflect the cost of my inputs.

I think that's really one of the keys we need to develop more into the broader base. I think that consumer acceptance will come.

I had the opportunity over the last couple of years to have French farmers on my farm on several different occasions, and one group was somewhat reluctant and said, "Why are you growing things that nobody wants?" The other group, when I opened up my field books and showed them what my round-up ready beans were costing me, you would have thought I was opening up Pentagon papers. They were making notes and thinking that they had just something wonderful and wondering how they could get there.

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I think it is somewhat hard to work with groups like some of the environmental groups that seem to be capitalizing on this when, on the one hand, they beat us and beat us and beat us because we are using pesticides and fertilizers, then, once we move to something that is more organic in base and does things in much less of an environmental impact, whether it be, as we currently have, with less use of insecticides with Bt and then herbicides, but also in the future with the perhaps more fertilizer-based or nutrient-based benefits we have, which would relate perhaps to hypoxia. It's, like, "Well, what do you want?"

Indeed, when I had a French TV crew on my farm here just about a month ago, that was one of his questions. He asked, "How do you feel about Greenpeace?" He said, "What is it you think they really want?" And I said, "I am not really sure, because, on the one hand, they are beating us on this; now, once we move to something else, they want to go there."

I understand consumer concerns. I understand what mad cow did and what happened there. We are not necessarily responsible for what happened earlier.

I think you are exactly right—we need to be more communication based in what we do, and I think we need to be preparing for the United States, because I think that concern has a very good possibility of growing here when it comes to GMOs.

Mr. SMITH. Well, last week 11 organizations, mostly the European organizations, met at Blue Mountain Lake in New York, so there are some coalitions that we are trying to get going. We really need to push them.

Mr. WILSON. Right. And, obviously, the National Corn Growers and Illinois Corn Growers, we want to be every bit a part of that because, number one, we don't want to lose a customer, but, number two, we don't want to loose tools and we don't want to set back what we think could be a very good future technology.

Mr. SMITH. Thank you, Mr. Chairman.

Mr. EWING. Thank you. And thank you to the panel.

Somebody said we needed to change the name of genetically modified organisms. Maybe we should just call it a "great marketing opportunity" and just get busy selling the advantages.

You have been a very patient panel. Thank you for being here and thank you for your testimony.

The record will stay open for 10 days.

The hearing is adjourned.

[Whereupon, at 1:15 p.m., the subcommittee was adjourned, to reconvene at the call of the Chair.]

[Material submitted for inclusion in the record follows.]

STATEMENT OF I. MILEY GONZALEZ

Mr. Chairman and members of the committee, I am pleased to appear before you today to discuss the future of renewable fuels and biobased products for American agriculture and for the American economy. The Clinton administration shares the chairman's and this subcommittee's strong commitment to this issue.

Biomass crops, such as poplar, willow, and switch grass, and agricultural waste streams could become important feedstocks of electric power, liquid fuel, and chemical production. In addition, biomass feedstocks can offer significant environmental benefits compared to fossil fuels. For example, energy produced from biomass crops does not add greenhouse gases to the atmosphere like the burning of fossil fuels.

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Advances in technology in farm production and processing offer enormous market opportunities for the Nation's farmers and hold the potential of transforming a significant portion of our fossil fuel based economy to a biobased economy. The Clinton administration wants to help encourage that transformation.

In my testimony today, I will provide a brief overview of activities undertaken by the Clinton administration that are promoting the research and development of a renewable fuels and biobased products industry. But I would first like to comment on H.R. 2827, the National Sustainable Fuels and Chemicals Act of 1999.

THE NATIONAL SUSTAINABLE FUELS AND CHEMICALS ACT OF 1999

The administration supports the goals of H.R 2827, the National Sustainable Fuels and Chemicals Act of 1999, but would prefer to see less prescriptive language. USDA believes a mix of directed and competitive research would be the best approach to address this issue. While funding provided under the bill's authorization would have to compete with existing programs under discretionary budget ceilings, we believe that by formalizing cooperation and coordination among the Department of Agriculture, the Department of Energy and other agencies in sustainable fuels and chemicals research, this legislation would help reinforce the commitment of the agencies to match resources and realize the potential of biofuels and biobased products. In addition to an advisory committee to help focus strategic planning, the development of a joint sustainable fuels and chemicals initiative to carry out research on biobased industrial products will ensure that funds from both departments are efficiently and effectively leveraged.

I am pleased to inform the subcommittee that we have improved cooperation and coordination among the Federal agencies. And, as we carry out the President's directive, we have been working together to accomplish a number of the goals of H.R. 2827. As you know, President Clinton signed Executive Order 13134 on August 12, 1999 on Developing and Promoting Biobased Products and Bioenergy. USDA and DOE are taking steps to meet the requirements of the E.O. and the accompanying Presidential Memorandum.

CURRENT USDA ACTIVITIES

USDA currently spends $9 million annually for biofuels research and $63 million annually for research on new industrial uses of biobased products. To coordinate these activities within USDA, Secretary Dan Glickman established the Biobased Products Coordination Council which I chair. In response to E.O. 13134, the Council has been renamed the Biobased Products and Bioenergy Coordination Council. The Council promotes biobased industrial product research, development, and commercialization through information sharing, implementation of strategic planning and providing policy advice for the Department. It is also developing a list of biobased products for use by Federal agencies and their procurement officials as directed by Executive Order 13101.

Ethanol research. One of the most promising roles biomass can play is strengthening our energy security. In 1995, USDA released a study on the net-energy balance of corn ethanol that showed that ethanol contains 22 percent more energy than used to produce the ethanol. And, since then, technological innovations in corn production and ethanol conversion have substantially reduced the energy required to produce corn ethanol. Our most recent estimate is that the energy content of ethanol is 34 percent greater than the energy used to grow, harvest, and transport corn, produce the ethanol, and distribute the ethanol. In addition, a recent study conducted by Argonne National Laboratory with USDA collaboration showed both corn and cellulosic ethanol produce significantly fewer greenhouse gas emissions than petroleum.

Research to reduce ethanol production costs can improve the competitiveness of and expand the quality of ethanol use as a fuel or fuel additive. USDA analysis suggests that long-term technology improvement strictly devoted to ethanol production might reduce costs by 9 to 15 cents per gallon. Our researchers believe that additional savings of 13 to 18 cents per gallon may be possible by developing higher value products—called coproducts—from raw material not used up in ethanol production.

To achieve these cost reductions, USDA research is targeting the development of organisms that will convert multiple, mixed substrates; superior product recovery and separation technology; high-value coproducts; more efficient technologies and processes for coproduct recovery and separation; and better fractionation of feedstocks. Developing new varieties of corn that would be easier to mill and provide higher levels of fermentable substrate and coproducts are also subjects of scientific effort and investigation.

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Research on Biodiesel and Other Biobased Products. Biodiesel, as well as lubricants, chemicals, and solvents produced from agricultural fats and oils, offer another opportunity to supplant petroleum derivatives. In doing so, an expanded market for agricultural fats and oils may develop, providing farmers with high-volume markets for high-value nonfood products.

Like ethanol, biodiesel has a positive net energy balance. This high-energy efficiency translates to a much lower emission of greenhouse gases compared with petroleum-based fuels. USDA conducted a study with the Department of Energy's National Renewable Energy Laboratory that found the use of biodiesel reduces net carbon dioxide emissions by 78 percent relative to petroleum diesel.

Selected niche market opportunities for biodiesel are emerging now. As a result of legislation passed last year, Federal agencies can use fuel blends containing 20 percent biodiesel as a credit against alternative fuel vehicle purchases. I am glad to report that in August 1999 we began using biodiesel fuel in approximately 80 USDA vehicles at two locations—the Beltsville Agricultural Research Center in Maryland, which includes the new George Washington Carver Administrative Center, and the Black Hills National Forest in South Dakota.

The major obstacle to the widespread use of fats and oils for biodiesel manufacture is the relatively high cost of biodiesel from food-grade oils. The full production cost of biodiesel is $2 to $3 per gallon compared with 50 to 60 cents for petroleum diesel. Tallows, yellow and white greases, and true wastes, such as sewage trap grease, are cheaper to use than food-grade oils.

To create economically viable sustainable fuels and chemicals markets based on renewable fats and oils, a focused research program is critical. USDA's research is aimed at lowering the cost of production, optimizing the properties of biodiesel feedstocks, and developing conversion and utilization technologies which take advantage of the unique properties of the fats and oils.

Other Biobased Products. We can further reduce our dependence on foreign oil if we can use agricultural materials that replace petrochemicals as a source of raw industrial materials. For example, until recently about 98 percent of all plastics were petroleum-based which are not generally biodegradable. USDA's biobased products program is designed to expand nonfood markets for agricultural products and provide biorenewable substitutes for petroleum-based plastics, printing inks, paints and other coatings, lubricants, and intermediate chemical products.

Agricultural Utilization Research. USDA has been conducting research to develop biobased products, under the moniker of agricultural utilization, for over 50 years, primarily at its four regional utilization centers. Many of the research activities I have talked about are conducted at the Agricultural Research Service National Center for Agricultural Utilization Research (NCAUR) in Peoria, Illinois. Other agricultural utilization research is conducted by ARS at Eastern Regional Research Center in Wyndmoor, PA; and at our regional laboratories in New Orleans, Louisiana and Albany, CA.

I would like to highlight some of the work carried out in Peoria. NCAUR works closely with the DOE National Renewable Energy Laboratory (NREL) on biofuels projects. A novel approach to reducing the cost of critical enzymes, such as cellulase, needed for converting biomass to fermentable sugars is currently underway. A cellulase enzyme, cloned and characterized by NREL scientists, is now being inserted into plants for expression by NCAUR scientists and collaborators at North Carolina State University.

NCAUR is a co-investigator on "Building a Bridge to the Corn Ethanol Industry: Corn Fiber Conversion in the Ethanol Industry," a project to determine how cornstover can be added to the corn fiber that is already processed in the plant, as well as, the feasibility of converting corn fiber to ethanol. NCAUR is working to develop a process that will hydrolyze corn fiber and corn stover to sugars using an enzyme-based process and then ferment the sugars to ethanol.

NCAUR also enters into specific cooperative agreements with universities for particular technical needs. For example, we have an agreement with Western Illinois University to develop an enzyme to produce biopolymers derived from agricultural commodities. I would also like to point out that the Cooperative State Research, Education, and Extension Service provides funding for a number of projects conducted at land grant universities and other academic institutions with agricultural interests. .

Cooperative Research and Developments Agreements (CRADA) with the private sector are important for transferring NCAUR invented biobased technologies to the private sector. Among the center's 27 active CRADA agreements is one with Caterpillar Inc. under which NCAUR scientists are developing biodegradable vegetable oil-based functional fluids for heavy equipment. Caterpillar engineers provide exper-

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tise on the physical properties and performance requirements of the fluids and evaluate the products that we develop in their earth moving equipment.

Biomass Initiatives. Farmers and processors need to see practical and successful demonstration projects before we should expect them to participate on a large scale. To that end, USDA is collaborating with DOE on a Biomass Power for Rural Development Initiative by which USDA is leveraging its existing programs and authorities with DOE funding to cost share with the private sector the development of integrated biomass power projects that couple dedicated energy feedstock production with advanced power conversion technologies.

The first award under this initiative with Niagara Mohawk Power Corporation of Syracuse, NY representing the Salix Consortium which plans to integrate dedicated short-rotation woody crops such as willows with power conversion by cofiring them with coal to produce energy. In the initial phase, a total of up to 47 megawatts of biomass power capacity will be produced at the three project sites, with a total of 6,000 acres of land dedicated to supplying willow feedstocks to these applications by 2001.

In Chariton Valley, IA, USDA and DOE are working to explore the possibilities of switchgrass as a fuel to make electricity. The Chariton Valley Resource, Conservation and Development Council received a research project waiver to harvest 4,000 acres of switchgrass from land enrolled in the Conservation Reserve Program and supply it to the power plant for cofiring with coal. A small-scale gassifier will also be investigated in the project.

Last fall BC International broke ground in Jennings, Louisiana to become the first commercial cellulosic ethanol plant. This DOE-supported plant is also receiving help to further advance the cellulosic ethanol conversion technology from USDA through Cooperative State Research, Education, and Extension Service (CSREES) research grants.

Renewable Portfolio Standard. Earlier this year, the Administration proposed the Comprehensive Electricity Competition Act which featured a Renewable Portfolio Standard (RPS). The RPS would require that 7.5 percent of U.S. electricity be generated from renewable sources by 2010. Improvements in the technology of biomass for electricity could help make biomass an important means to meet the RPS or any similar standard that might be adopted.

Conclusion. The development and expansion of a renewable fuel and biobased products industry founded on a strong agricultural and forestry sector can play an increasingly important role in enhancing energy security, cleaning our environment, and promoting farm and rural economic growth. Petroleum and fossil fuel prices, feedstock costs, coproduct markets, energy and environmental policies, and advances in technology are all critical determinants of market growth for biofuels and biobased products. The Clinton administration will work with Congress and others to advance the technology and improve the economics of producing and marketing biofuels and new biobased products from agricultural commodities.

That completes my testimony, Mr. Chairman. I am happy to respond to any questions.

Attachment—August 4, 1999

May, 1999—The Economic Impacts of Bioenergy Crop Production in U.S. Agriculture.

Study results indicate that at $40 per dry ton of energy crops at the farm gate, about 42 million acres could be planted to energy crops by the year 2008, with annual production of 188 million dry tons of biomass feedstock and no significant increase in major commodity prices. Net farm income is estimated to increase by $5.5 billion over the baseline projection from 2000 to 2008.

April, 1999—Ethanol and Its Implications for Fuel Supply presented to the EPA Blue Ribbon Panel On Oxygenates. An OEPNU analysis indicates that increasing ethanol production from 1.6 billion gallons per year in 2004 to 3.4 billion gallons that year, and every year thereafter, will increase farm income by $19.3 billion over the baseline projection (1999–20 10).

April, 1997—USDA Analysis of Withdrawing Ethanol Tax Incentives. Compared with the FY 1998 President's budget baseline, which retains the Federal ethanol tax exemption, elimination of the Federal tax benefit will lower net farm income by $5.9 to $10.2 billion during crop year 1998–2005. Net farm income in nine major corn producing states declined by $2.6 to $4.4 billion.

Potential Biodiesel Markets and Their Economic Effect on the Agricultural Sector of the United States, A. Raneses, et. al., Industrial Crops and Products, 9 (1999)151–162. The study finds increased demand for soybean oil for biodiesel increases annual average (1996–2000) soybean oil price by up to 14.1 percent. As a

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result, U.S. soybean prices rise 2 percent and soybean meal prices fall by 3.3 percent. Net farm income increases by up to 0.3 percent.

Assessment of Biodiesel Production Potential in the Southeast, D. La Terre Ugarte, et. al., Prepared for the Southeast Regional Biomass Energy Program, Contract 97RKW-219278. Assuming biodiesel demand increased to 100 million gallons from 1998 to 2007, the U.S. average price of soybean oil increased 7 percent, soybean prices increased by 0.5 percent and soybean meal price dropped 2.3 percent. Net farm income increased by 0.2 percent.

Economic Analyses of New Crops and New Uses. Industrial Uses of Agricultural Materials, Situation and Outlook Report, Economic Research Service, USDA, Washington, DC, published from1993 to 1997. Profitability of crambe, an annual oilseed crop grown in North Dakota, was evaluated. Net returns to land, labor, and management amounted to $83.04 per acre, nearly twice the next highest returns of $44.21 per acre from Canola production. Direct and indirect and induced effects of the crambe production resulted in an addition of $1.8 million dollars, $900 million in value added, and 24 additional jobs in the 15 county central North Dakota study region. Lesquerella is a new oilseed crop being developed for production in Arizona, New Mexico, and Texas. At production cost of $250 per acre and yields of 1,800 pounds per acre, net returns at seed prices of 21 cents per pound would total $128 per acre.

TESTIMONY OF DONALD A. HOLT

Congressman Ewing and distinguished members of the subcommittee:

Thank you for inviting me to testify regarding H.R. 2827, The National Sustainable Fuels and Chemicals Act of 1999 and on biomass research, in general. Needless to say, this topic is of great interest within my institution and among its stakeholders in the food and agriculture sector of Illinois. Farmers and agribusiness people in the corn belt are keenly aware of the dog-eat-dog competition of commodity markets and are anxious for us to explore new possibilities for diversification, differentiation, and market expansion.

Throughout my own experience as a farmer, researcher on forage crops, and later Head of the University of Illinois Agronomy Department, my efforts usually focused on increasing total biomass production by crops. When I became Director of Illinois Agricultural Experiment Station, my administrative duties broadened to encompass research on processes by which biomass becomes a useful source of food, feed, fiber, and renewable sources of fuel and chemical feedstocks.

Historically, land-grant Colleges of Agriculture placed most research and educational emphasis on food, feed, and fiber. Likewise, they tended to focus on crop production, because most of their clients were farmers. In the background, however, there have been important efforts to exploit the potential of crops to provide renewable sources of fuel and chemical feedstocks. During my 19 years at Purdue University, one of my colleagues was identified as a Professor of Chemurgic" Crops. His research focused on crops as a source of industrial lubricants.

Over the last two decades, researchers at the University of Illinois generated important technological advances in production of ethanol, biodegradable plastic, and extrusion-molded plastic products from corn; thin plastic films from corn zein and other protein sources; and injector technology for aspirating ethanol into diesel and gasoline engines and for use with soy-based biodiesel fuel.

A major ethanol producer in Illinois uses a continuous fermentation process and associated equipment that grew out of research by a University of Illinois food scientist. Another food scientist used biotechnology to improve the productivity and efficiency of microorganisms that produce butanol, a valuable chemical feedstock. He and his colleagues refined the use of these microorganisms in continuous process industrial fermentation. These scientists made important basic and practical discoveries related to microbial processes and membrane- and ceramics-based separation techniques for continuous process fermentation.

It has been exciting to watch these developments but also frustrating, in that there were rarely sufficient resources to pursue these promising possibilities as aggressively and strategically as would be justified by their potential for economic growth, increased financial viability of farming operations, enhanced environmental quality, and improved health and welfare for consumers. H.R. 2827 promises to help alleviate that bad situation.

It is encouraging and particularly timely, given the great interest and investment in biotechnology research, that H.R. 2827 would authorize the appropriation of funds to support research and development (R&D) on sustainable fuels and chemi-

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cals. Advances in biotechnology open up an incredible number of new food and non-food products that can be produced in and by plants, animals, and microbes. Many of these fall in the categories of renewable fuels and chemical feedstocks.

We are rapidly approaching a situation in which some plant, animal, or microbe can be modified to produce virtually any organic chemical, either in an industrial process or in normal growth and development in fields and feedlots. However, once an organism is modified to enhance its production of an existing constituent or cause it to produce some new constituent, many other things will have to happen before a new commercial product will be available for practical use.

Inevitably, the new products envisioned by this legislation will be produced in complex, multistage, value-added enterprises carried out by producers, processors, distributors, retailers, and users of the new products and by suppliers of inputs and support services. Also inevitable is the need for unprecedented levels of communication, coordination, and integration up and down those complex value chains.

Likewise, the R&D efforts creating and supporting these complex value chains will, inevitably, need to be coordinated and integrated over diverse disciplines, R&D functions (basic, developmental, and adaptive research and technology transfer), and stages in complex value-added processes. They will have to address not only complex technical characteristics of new products, but also their marketability and potential environmental, social, legal, safety, and political implications.

Competition from other groups, perhaps in other nations, seeking the same or similar goals will further complicate the situation. To meet this competition, R&D will have to be strategically sound, fast, and efficient. This situation will require unprecedented levels of communication, cooperation, and coordination among institutions, agencies, organizations, and private firms. Public/private alliances will be extremely important in this situation.

To state this need another way, we need to move from the linear paradigm of R&D organization toward the parallel approach (see attached diagram). In the parallel approach, R&D functions are conducted simultaneously instead of sequentially. Activities are organized around practical goals and evaluated in terms of whether the goals are achieved. In industry, this is often referred to as concurrent engineering or functionally integrated R&D.

At the University of Illinois, we've gained some experience with the parallel approach, thanks to strong encouragement and support of a stakeholder group known as the Illinois Council for Food and Agricultural Research (C-FAR). C-FAR insists that research sponsored by C-FAR funds, which are state funds, be not only tactically but also strategically sound and organized in the parallel manner. This is especially true of C-FAR's strategic research initiatives, each of which is funded at over $1 million per year.

Our experience is that it is hard, especially in public institutions, to make the transition from the linear to the parallel approach. The linear approach requires more planning, team building, and monitoring of progress, and much more coordination. The transaction costs are high and need to be kept to a minimum. Overall project costs are high, because each effort necessarily has many component subprojects. All the pieces of the puzzle eventually need to come together and fit.

The situation is further complicated by the fact that few institutions, agencies, or private firms have all the research resources and capabilities needed to conduct useful research and educational programs in support of all stages in a specific value chain. Consequently, R&D in the parallel mode almost always involves cooperation between two or more groups. At best, there are bureaucratic barriers that hinder cooperation between institutions, agencies, and firms. These barriers must be overcome to achieve success.

There are many positive benefits to the parallel approach. Overall progress is more rapid, which saves resources and helps meet time-constraints imposed by competition. Bottlenecks and other problems are anticipated or detected early and circumvented. Progress is easier to measure, since clear goals are established.

Students, professors, and other cooperators involved in projects of this nature gain valuable experience in team efforts, learn how to work effectively with specialists in other disciplines, and become more aware of the importance of their individual contribution to each overall effort. This approach does not restrict the creativity and flexibility of basic scientists, as was a major fear initially. An important intangible benefit is the shared vision, commitment, and entrepreneurial spirit engendered by functionally integrated projects.

We strongly support the vision embodied in H.R. 2827. It has great positive potential for all participants in the U.S. food and agriculture sector and for consumers of agricultural products around the world. We hope that, as its provisions are implemented, procedures and protocols will foster and expedite the complex, multidisci-

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plinary, cross-functional, inter-institutional, team efforts required for success in research on sustainable fuels and chemical feedstocks.

Thank you for the opportunity to express our views on this important matter.

TESTIMONY OF RICHARD JONES

Mr. Chairman, members of the subcommittee: I appreciate the opportunity to speak to you today regarding H.R. 2827, the National Sustainable Fuels and Chemical Act of 1999. I am speaking in my capacity as Chair of the Experiment Station Committee on Organization and Policy (ESCOP), which represents the State Agricultural Experiment Stations. As well, my remarks have been developed in consultation with some of our colleagues in the Extension Committee on Organization and Policy (ECOP), which represents the Cooperative Extension System.

To facilitate our discussions here today, I will target my comments to the legislative language of this bill, rather than providing a more technical narrative regarding the merits of specific areas of biomass and biofuels research. However, we will be more than happy to provide detail and technical background to the Members and staff of the committee on any of the following points.

We support H.R. 2827

We commend the Congress and the administration for the bipartisan and bicameral approach that has been taken to improve research on the conversion of biomass into biobased industrial products. It is remarkable to see the breadth of support that this legislation enjoys, with approval coming from farm, industry and environmental groups. The administration is already moving to implement the intent of provisions developed in this legislation. These beginning efforts to facilitative multiagency cooperation between the Department of Energy and the Department of Agriculture are commendable. The level of support and cooperation speaks well to the importance of this legislation. Like other groups, we would like to make some recommendations that we think would further strengthen the bill, but we see it as fundamentally sound and well-developed legislation.

We concur with the value and need to promote biomass and biofuels industries

Supporting the increased use of biomass to develop biofuels and other biobased products has a number of benefits:

(1) Development of alternative fuel sources, thereby reducing U.S. dependency on foreign sources, and, providing alternative energy sources in the future when petroleum reserves begin to decline;

(2) Benefits to the environment by potentially "cleaner" fuel combustion emissions, increased carbon sequestration in biomass crops; and providing alternative crops and farm practices in fragile areas where production of traditional crops and practices could be detrimental;

(3) Turning agricultural "waste" into useful products, such as the use of sugar cane;

(4) Development of alternative crops and markets for agricultural producers and processors;

(5) Development of biobased energy plants that capture capital and economic resources in rural communities.

We support a comprehensive, market-oriented problem-solving approach

Many of the discussions regarding increased use of biomass for developing biobased products focuses on reducing the costs of production and processing. This is important. However, this is also a "systems" problem in that biomass processors need assurances that they will have a steady biomass supply while biomass producers need assurances of a steady market demand. Both the supply and the demand have to emerge together. Moreover, making biomass products price-competitive with fossil fuels and petroleum-based products requires innovative and integrated approaches.

For example, a major cost limitation in the use of grass crops for biomass products is the cost of transportation—it can cost too much to dry the grass, which makes it much lighter for shipment. As well, biofuel and biobased products derived from a grass crop may not be cost-effective by themselves. However, innovative projects have emerged that simultaneously address the issues of transportation, fuel production and biomass-based products. In one instance, a small processing plant was established on a farm, which took care of the transportation costs. The plant was small enough so that it did not need a larger supply of biomass, which might not be steadily available in the area. The farmer generated energy that he used in his own operations and the "surplus" energy was sold back to the local power supply grid. A byproduct of the energy generation is used for feeding his livestock. The farmer calculated that the combination of all of these activities made these efforts

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profitable as a whole, but removing any of these components would have made the enterprise unprofitable.

Because of these complexities, H.R. 2827 could be strengthened by more clearly stating the need for targeting some of the supported research to address the development of biomass fuel and products in the context of economically viable "production systems." If it is possible, this legislation would also be strengthened by clarifying that producers and processors would be eligible to receive research tax credits for exploring the development of these new "systems."

We concur with the value and need for expanded research in areas identified by the bill and recommend some additional areas that need to be addressed

The recent National Academy of Science report, the President's Council on Science and Technology, and indeed, the legislative language of this bill, provide an excellent listing of the critical topics in the arena of biomass production and processing that need additional research. We strongly endorse the issue areas identified in this bill and we would like to suggest several additional areas of research be identified in this legislation.

- We note that some industry groups have suggested in addition to cellulose breakdown, research is also needed on developing better catalysts and separation processes. As well, industry and processors have suggested that additional research is needed in the area of developing alternative uses for plant remains and the by-products of biofuel production. We concur with each of these recommendations.
- We note that some environmental groups have called for additional research on the environmental consequences of producing, processing and using biomass for fuel and industrial processes. We concur.
- We also note that some farm groups have suggested that support for corn-based products and grass-based products be managed so that both are supported and advanced, rather than becoming competitive efforts. We concur.
- Lastly, we suggest that additional language be provided that clarifies the need to work on biobased fuels and products in an integrated systems approach, with adequate support for economic and market research to support the development of new technologies, processes and products.

We recommend adding a capacity to address education and extension needs as part of a comprehensive approach

It is not sufficient for research to develop new biomass crops and more cost efficient production technologies. The research needs to be communicated to producers and processors. If production and processing problems emerge, this needs to be communicated back from the field to the scientists. If novel partnerships between producers and processors are necessary to develop economically successful biomass production systems, someone needs to be charged to act as a "social catalyst," creating the opportunity for the various actors to meet and develop joint ventures.

Our land-grant system is unique in that it combines the need to address research and extension together to apply science to real world problems. The development of biobased products from biomass is a real world problem that needs research, but it also must have the Cooperative Extension System's capability to provide outreach, facilitation, and education. The bill needs to add a section that clearly identifies support for Extension activities in biomass production and processing.

We support innovative multi-agency collaboration. We recommend clarifying the proposed language on funding mechanisms to ensure that the intent of the bill is realized.

This legislation does an excellent job of stating that the Department of Energy and the Department of Agriculture need to coordinate and collaborate. The bill suggests that resources available in each agency should be directed to this critical issue area. And, the bill provides that new resources are authorized for appropriations that should be coordinated between the two agencies. The bill almost seems to suggest that the two agencies pool and manage these new resources together. This level of collaboration to address an issue that crosses the jurisdiction and responsibilities of two agencies is ideal. We completely support the intent of the legislation.

We have noted through time, however, that there are sometimes obstacles to this level of collaboration. Agency officials and budget officers want to be very sure of what resources are "ours" as opposed to "theirs." Partly, this is to ensure good management and track resources and liabilities. Partly this is protecting "turf." Either way, agencies can find interesting and novel reasons for not combining resources. As well, your colleagues on the Congressional Appropriation's Subcommittees have an understandable need to be reassured that they are not paying for the same services in two different agencies. They will want to know what is unique in the funding that is provided to DOE as opposed to what is being done with funding provided to USDA.

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Given these challenges, we suggest that the reports required in the bill clarify how programs and funds were managed in a collaborative fashion. At the same time, the reports should clarify what was unique to the contributions provided by each of the funding agencies.

We recommend building on the unique Federal-state-local partnership built into the land-grant system

In addition to the unique partnership between research, extension and education built into the land-grant university system, we are also unique in that we are simultaneously engaging our Federal, state and local partnerships. The State Agricultural Experiment Stations and the State Extension system collaborate with USDA's Cooperative State Research, Education and Extension Service (CSREES). At the same time, we collaborate at the local level though distributed research and demonstration sites. The State Extension system has agents in practically every county in the country. This positions the land-grant community across the geographic landscape where biomass is produced. We have a historic working partnership with the farmers that will produce the biomass. We are situation near and in the small rural communities where new processing plants and support infrastructure need to emerge. Given these characteristics, we feel that we are uniquely positioned to assist in the research and education activities that will be necessary to nurture and emerge new biomass based industries. We look forward to working collaboratively with our partners at USDA and a strengthened working relationship with the Department of Energy.

Again, we commend this committee for its leadership in bringing this important legislation forward. At the appropriate moment, I will be happy to respond to any questions you may have and we look forward to working with you and your staff in the future.

STATEMENT OF DOUG WILSON

Mr. Chairman and members of the committee, I am Doug Wilson, a corn and soybean grower from Gridley, IL, and president of the Illinois Corn Growers Association. I am testifying, today, on behalf of the National Corn Growers Association (NCGA), representing 30,000 corn growers in 48 states. Thank you for this opportunity to provide the Committee with our views regarding H.R. 2827, the National Sustainable Fuels and Chemicals Act of 1999. We appreciate the leadership you, and other members of this committee, have always shown in support of agricultural research.

Increased population, coupled with rising demands for consumer products and finite fossil fuels, will require us to increase, substantially, the amount of biobased feedstocks for industrial production and fuels if we are to meet these needs and demands. At the same time, we must decrease our reliance on unstable foreign oil supplies. We are at a unique place in history in that the tools are beginning to be available that will revolutionize the American and global economies and will ensure that future demand is met with the increasing use of renewable resources as basic, chemical building blocks and fuels. The 21st century is referred to often as the "Biology Century;; because genomics (i.e., the science of identifying the location and function of genes), coupled with biotechnology, is ushering in a new age of innovation in plant-based technologies that will revolutionize the American and world economies. We will be able to meet the challenges of the 21st century much sooner if we focus our efforts and act now to fund much needed research. Last year, Philip H. Abelson wrote that "ultimately, the world will obtain most of its food, fuel, fiber, chemical feedstocks, and some of its pharmaceuticals from genetically altered vegetation and trees." (Science, Vol. 279, p. 2019.)

To ensure sustainable economic growth, the U.S. needs a secure, long-term supply of durable, high-performance raw material inputs. Both renewable resources and non-renewable resources will be needed in the future. Renewable materials, from U.S.-grown crops, trees, and agricultural wastes can provide us with fuel and many of the same basic, chemical building blocks as petrochemicals. In addition, plants can provide other chemical building blocks that petrochemicals cannot. Using historical, average prices for corn and oil, the cost of carbon from corn approaches the cost of carbon from oil.

If we are to fully realize the potential for biobased resources as a supplement to fossil fuels, we must begin laying the research foundation, today. We will need new routes for more efficient processing and utilization as well as a whole range of plant-derived building blocks. New technologies require time to develop and implement. Now is the time for significant research and development on what renewable

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sources and novel processes might be available, and for beginning to develop selection criteria among the possible alternatives.

Mr. Chairman, generally, when we talk about biobased products, most people believe that we are only interested in ethanol. There are, today, numerous other corn based products that are environmentally friendly and will reduce our dependence on fossil fuels. We anticipate that there will be considerably more products in the future.

Renewable feedstocks, derived from plant-based materials, afford us the opportunity to meet the growing demand for chemicals in the U.S. and throughout the world. The current U.S. chemical industry uses about 900 million barrels of oil, annually, to produce organic chemicals. This equates to 12–14 percent of the total oil consumption in the United States. The demand for chemicals is expected to continue to increase as the population expands and alternatives are needed to meet this increased demand.

The most significant opportunity to help offset the need for additional oil consumption for chemical production is the use of alternative feedstocks that can be derived from renewable plants and crops. These may include traditional crops, such as corn, soybeans, wheat, and new crops, such as switchgrass and fast-growing poplars, or plant residues.

In 1996, the U.S. agricultural, forestry, and chemical communities began working with the Department of Energy (DOE) to develop a long-term, strategic vision based on increased utilization of renewable inputs for basic, chemical building blocks. At the Commodity Classic, in February 1998, the unique, broad-based coalition of growers, manufacturers, environmentalists, academicians, and state and Federal Governmental agencies unveiled a long-term, strategic vision called the "Plant/Crop-based Renewable Resources 2020" (Renewables Vision). The coalition agreed to work towards achieving significant increases in the use of crops, trees, and agricultural wastes as feedstocks to produce a wide range of everyday consumer goods and industrial products.

The strategic vision is to provide continued economic growth, healthy standards of living, and strong national security through the development of plant/crop-based (often referred to as "biobased") renewable resources that are a viable supplement to non-renewable, diminishing fossil fuels. The principal goal of the Renewables Vision is for renewable bioproducts to capture 10 percent of the basic chemical building blocks market by 2020 and to achieve 50 percent of that market by 2050. Gaining 10 percent of the market would represent a five-fold increase from today's tiny market share of these basic, chemical building blocks. The Renewables Vision envisages supplementing petroleum with biobased renewables as sources of material inputs that can be used as industrial building blocks to create a wide range of consumer products.

Accomplishing these goals will help to cut costs, decrease our dependence on oil imports, reduce greenhouse gas emissions, increase recycling opportunities, and create world-class industries here at home and revitalize our rural economies.

After the Renewables Vision was unveiled in 1998, work on a technology roadmap began. Inputs were gathered from two workshops with scientific and marketing experts from a broad range of industry disciplines. The roadmap, published in February 1999, identifies performance goals and establishes a focused research and development agenda for developing the technologies needed to make the industry vision a reality. The technology roadmap identified research needs in four major research categories. For each of these categories, the top priority is:

• Plant Science—understand gene regulation and control of plant metabolic pathways;

• Production—alter plants to produce components of interest rather than heterogeneous seeds;

rocessing—develop new separations methods—membranes and distillation; and

• Utilization—understand structure function relationships for plant constituents (protein, starch, etc).

I ask that a copy of the Vision and the Technology Roadmap be included in the hearing record.

Fulfilling the vision of a biobased economy will require vast resources from numerous public and private organizations. A coordinated, industry-led effort will help us achieve our goals. We believe that it is not necessary to repeat the development of a technology roadmap in the biobased industrial products area, at this time. We believe that the Technology Roadmap for the Renewables Vision can and should serve as a solid foundation for establishing funding priorities.

In addition to our interests in using plants for basic, chemical building blocks, we are also interested in additional research on biobased fuels. As a corn grower, I

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would like to thank you and many other members of this Committee for the strong support you have shown for ethanol. Your work and attention are still needed.

As you know, ethanol is very important to corn growers. Today, we use 550 million bushels of corn to produce biobased ethanol. Approximately 95 percent of biobased ethanol production comes from corn. Other plants, such as poplar trees, and cellulosic materials (plant and crop residues and wastes) can be used for ethanol production. Given the importance of ethanol to the future security of our nation, we believe it is of the utmost importance for us to have public/private partnerships to enhance research and the pre-commercial development of new technologies to improve the efficiency of corn and other grain-based ethanol technologies, while also building a bridge to the biobased chemical industry.

One significant component of this effort should be a corn processing research pilot plant. The need for this facility has been recognized by industry, government, and farmers for some time. A pilot plant would facilitate the transfer and acceptance of new technologies and innovations in grain processing for fuels and chemicals. The pilot plant would allow small corn millers to band together and form partnerships with the NCGA, state grower associations, university researchers, and each other to pursue the development and commercialization of new technologies that will improve the economics of corn processing. Breakthroughs in processing could boost demand for corn significantly.

The pilot plant is needed because of the risk to industry of testing new technology in their operating facilities. The NCGA has identified potential partners for several research projects and they were not willing to convert their facility to test the project. Many of these potential partners are small agricultural cooperatives without the resources to risk current income even for potentially large returns in the future.

It is important to point out that the benefits of this facility extend beyond corn. The fermentation aspects of the plant could be utilized by other crops and cellulosics. In addition, much of the hydrolysis, fermentation, and separation technology developed will be directly transferable to cellulosics. We are pleased that an authorization for the pilot plant is included in this legislation.

Mr. Chairman, we believe that H.R. 2827 provides a good framework for research aimed at achieving a greater utilization of the broad base of renewable resources for consumer needs. Plant based resources are available in several forms—wood, cellulose, lignin, starch, oil, amino acids, etc., and may come from different sources including annual crops such as corn, soybeans, and wheat or other biomass forms, such as crop residues, crop by-products or dedicated crops. Processes and technologies will need to be developed that can support this broad base of feedstocks and not be limited to cellulosics. Corn, soybeans, and other plants will continue to play an essential role in providing fuels and industrial feedstocks far into the future. By authorizing the funding of projects that address the research needs for all plant-based resources, H.R. 2827 can help us achieve a biobased economy.

Multi-disciplinary research, along several different pathways, will be necessary to improve the performance of plant resources as raw materials. It will help to ensure that we can meet the ever-increasing world demand for basic, chemical building blocks and for fuel by using plant and crop-based feedstocks.

The National Corn Growers Association supports H.R. 2827 and look forward to working with you to gain enactment of this legislation. Thank you for the opportunity to testify. I would be happy to answer any questions.

STATEMENT OF DAN W. REICHER

Mr. Chairman, and members of the subcommittee, I am pleased to testify today on bioenergy. In my testimony I will address why there is a need-and a great opportunity-for a broadly coordinated initiative in bioenergy at this time. Also, I will provide an overview of what we in the Administration have undertaken, with industry, the national laboratories, universities, state governments, and other stakeholders in the bioenergy arena, focusing on the recent Presidential Executive Order and the Department of Energy's Bioenergy Initiative. Finally, I will comment on H.R. 2827, the National Sustainable Fuels and Chemicals Act of 1999, and suggest some modifications.

THE BENEFITS OF BIOENERGY PRODUCTION AND USE

Bioenergy resources such as agricultural and forest products and waste residues already meet more than 3 percent of U.S. energy requirements. Consumption of bioenergy products, particularly electric power and fuels, has been increasing by 2 percent annually since 1990. However, this growth is not enough-indeed, it is far too

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slow to meet our fast-growing concerns about air quality, climate change, dependence upon foreign energy supplies, and weakening economic conditions in the nation's farm and forestry sectors. If we are to see a meaningful decline in reliance on fossil fuel use over the next decade and beyond; if we are to lessen our economic and national security vulnerabilities to interruptions in energy supply; if we are to stimulate a whole new area of activities to respond to the crisis in the farming and forest industries, then we must have a concerted national effort to develop a range of renewable energy sources, with bioenergy as a centerpiece. Biomass resources are an important domestic and renewable source of energy. Moreover, production of energy and chemical products from biomass offers economies of scale that eventually will permit us to supplant fossil energy to a truly significant degree.

The bioenergy industry at the moment, however, remains small and segmented; there is woefully inadequate integration across the biofuels, biopower, and biochemical products industries. Our industry integration meetings this year were one of the few times, if not the first, that senior corporate decision-makers from all three industry areas, as well as farmers, have held a common dialogue on the state of the industry and its potential. The lack of integration among technologies, their applications, markets, and policies has been a major barrier to industry growth. More extensive technology integration, along with an integrated strategy for resource development and use, processing facilities, and product development, would create a strong momentum for both growth and competition within the bioenergy industry. Such integration could stimulate innovative product lines and new markets, while enhancing the development of processes and facilities that use a variety of feedstocks while producing a broad range of products. A long-term technical and economic objective is to make a "ton of biomass" a viable market competitor to a barrel of imported oil. That ton of biomass could be processed in a "biorefinery" that can quickly and easily vary its feedstocks and its product mix according to market signals, much as petroleum refineries do with oil today. And not least, integration among biomass research, development, and demonstration programs can shorten the time to move a new process or product from the laboratory to the marketplace.

We at the Department of Energy (DOE) believe a more focused, visible, and integrated national effort can meet the challenges and make the U.S. the world leader in production of bioenergy and biobased products. Some of those challenges lie in: improving crop yields; introducing new crop varieties tailored for biorefining; rethinking land use policies to blend resource production with soil and environmental conservation; developing biomass harvesting, distribution, and processing technologies; developing new product opportunities from biochemicals; and building the level of confidence in the investment community that will be needed to finance these undertakings.

A variety of specific advances needed to meet these challenges have already been identified. One example is the potential to engineer plants with greater carbohydrate composition and specific "designer" properties tailored to reduce the required degree of processing and conversion—to enhance energy and chemical production. In the area of processing, objectives include better separation technologies for easier and more efficient recovery of products, as well as conversion techniques in addition to biocatalysis. Near term objectives include development of inexpensive cellulose enzymes having progressively faster specific activity, and new genomic and genetic engineering of cellular wall variability. A major additional challenge lies in developing technological and economic assessments and models for such factors as variability of resource and product mixes for biorefineries, and impacts of biobased products on markets and pricing of competing products. We also must address any potential environmental risks posed by these types of technical advances.

Meeting these challenges will take a commitment from all partners, including Congress and the administration, to a nationally coordinated program. We are now at the leading edge of much of the R&D and systems integration necessary to grow this industry from one of a small number of niche products and markets into one that is fully competitive across the board and fully responsive to the whole range of market signals. Such a national commitment will ensure that the goals of both the administration and H.R. 2827 will realize the full potential of our bioenergy resources and can be reached through greater integration of existing efforts, accelerated research and development, and capturing enhanced synergistic benefits on behalf of consumers.

The creation of a robust bioenergy industry in the U.S. will have tremendous economic, environmental, national security, and even social benefits. For example, the November 1997 report by the President's Council of Advisors on Science and Technology (PCAST) points out that 4.7 quadrillion BTUs of bioenergy could be available at attractive cost by 2015. Just over half could come from agricultural residues, while just 18 million acres of dedicated energy crops could provide the rest, which

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is a very small percentage of total U.S. agricultural land. In one scenario, 31 billion gallons of ethanol could be produced from this biomass, and 12 gigawatts of electricity-as a by-product of making fuel-could be generated in conventional steam plants. That amount of ethanol, powering light-duty vehicles with internal combustion engines, would reduce U.S. requirements for gasoline by as much as 22 percent.

Another prime benefit of a fast-growing, robust bioenergy market will be the demand for dedicated energy crops and for agricultural and forest residues of all types, providing new revenue streams for farmers and cash-flow for rural economic development. The present crisis faced by the agricultural and forestry sectors due to weather, foreign production, and commodities fluctuations could be greatly alleviated by long-term energy crop contracts to biorefineries. New crops, along with new planting, tillage, and harvesting technologies, can improve the utilization of marginal lands, while better preserving the ecosystem. Better forestry management and harvesting for bioproduction can reduce the danger of forest fires while improving the overall health of forests. And not least, investments made in bioenergy technologies, infrastructures, and market development could increase profitability for U.S. firms competing in global markets, while simultaneously providing for the world's energy needs in an environmentally sustainable way.

EXECUTIVE ORDER 13134: ENSURING A MORE INTEGRATED FEDERAL EFFORT

I am pleased to report that on August 12, 1999, the President signed Executive Order 13134, Developing and Promoting Biobased Products and Bioenergy. Senator and Agriculture Committee Chairman Richard Lugar (R-IN), Secretary Richardson, Secretary Glickman, and EPA Administrator Browner as well as a wide variety of industry stakeholders were present at the signing ceremony. The Order will guide coordination of Federal efforts to accelerate the development of 21st century biobased industries that use trees, crops, agricultural, forest, and aquatic resources to make an array of commercial products including fuels, electricity, chemicals, adhesives, lubricants, and building materials. In a separate Executive Memorandum on these same issues, the President set a goal of tripling U.S. use of biobased products and bioenergy by 2010. In the President's remarks at the signing ceremony, he stated that reaching the tripling goal "would generate as much as $20 billion a year in new income for farmers and rural communities, while reducing greenhouse gas emissions by as much as 100 million tons a year-the equivalent of taking more than 70 million cars of the road."

The President's Executive Order establishes a permanent Interagency Council on Biobased Products and Bioenergy consisting of the Secretaries of Energy and Agriculture, the Environmental Protection Agency Administrator, and the Director of the National Science Foundation, and other agency heads to develop a detailed strategic plan that will be presented annually to the President. The Council will review major agency regulations, incentives and programs to ensure that they are being used effectively to promote the use of bioproducts and bioenergy. The council's plan will be reviewed by an outside advisory group that will be comprised of representatives from biobased industries, farm and forestry sectors, universities, and environmental groups. The Order also directs DOE and USDA to establish a National Biobased Products and Bioenergy Coordination Office to manage the preparation of interagency budgets and ensure effective day-to-day coordination of actions designed to implement strategic plans and guidance provided by the Council and respond to recommendations made by the Committee. The Order also calls for USDA and DOE to create internal working groups that will provide strategic planning and policy advice to the decision-makers within each agency. The two working groups have met several times and will be working with other Federal agencies to discuss implementation strategies for the actions called for in the Executive Order.

As a result of the Executive Order, existing research, development, and demonstration (RD&D) programs of DOE, USDA, and other agencies will be better coordinated to achieve common goals. With leadership from the White House, we are working together to expand the scope of existing RD&D and speed the development of high-tech feedstocks, conversion technologies, and biobased industrial products and help reach the tripling goal that was outlined by the President. It is our aim to focus the resources and objectives of relevant portions of these agencies on developing the research base, organizational mechanisms and resources need to make substantial advances in bioenergy.

A NATIONAL BIOENERGY INITIATIVE: BUILDING A MORE INTEGRATED INDUSTRY

The potential to develop a robust bioenergy industry is great. I want to present a brief view of how the Government—consistent with the Executive Order—is working with industry to not only scale up current activities, but to jointly develop an

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integrated bioenergy strategy-ranging from basic research, through feedstock production and processing, to biobased industrial and consumer products. Such a strategy will involve integrated teams of researchers and engineers from the public, private, national laboratory, and university sectors. It will also require interaction among public policy makers, business and financial investment managers, farmers and foresters, and trade and commodity brokers, as well as the research community. Effective integration of this type is a necessity if we are to make the vision of a bioenergy-based economy a reality.

We have already begun this year to move toward that vision with the formation of an industry-led Bioenergy Industry Vision group, composed primarily of senior corporate leaders from the several sectors of the industry, along with senior Federal and national laboratory officials, grower representatives, and environmental and consumer leaders. Its goal is to develop and adopt a common vision of what the industry could be in the future and what it needs to get there. We have developed a final draft of the vision that will be distributed to our industry reviewer group in the coming weeks. Following extensive industry dialogue and eventual adoption of a vision by the industry as a whole, other industry-led groups will work to draft technology and policy "road maps" to define the pathways industry and government need to follow to make the vision happen.

DOE's Bioenergy Initiative is consistent with the actions called for in the Executive Order—as well as H. R. 2827—in several ways. The products produced from the vision and road map process will be a good source of industry input for the plans and reports called for in the Executive Order. The Vision document will provide guidance on industry's views for use by the Interagency Council in developing the strategic plans. The Vision and road maps will serve as references for the agency working groups in their formulation of plans to meet the goal of tripling America's bioenergy use by 2010. And, several members of our Industry Vision group may be selected to participate in the advisory committee called for in the Order.

The heart of the Bioenergy Initiative undertaken by DOE is the notion of strong industry participation and leadership. Industry leaders are already working closely with DOE, the Department of Agriculture, and other Federal policy makers and program managers to develop coordinated activities, analytical tools, and assessments of technological, institutional, and infrastructure barriers to bioenergy development. Analyses of policies that help or hinder that development, as well as assessments of market potential for various types of products, are also critically important and will be pursued along with assessments of technology needs.

Along with strong industry leadership, another crucial element of our strategy is the focus on cross-cutting technologies and systems integration. Building and demonstrating the feasibility of multi-product bioenergy facilities is needed to overcome the private sector's inherent reluctance to devote large-scale resources to a new industry in a highly competitive economic arena. This effort will complement ongoing projects in fundamental soil, plant, and ecosystem science, as well as in technology applications for ethanol, biodiesel, gasification, co-firing, biochemicals, and combined-heat-and-power systems. Existing models and analyses will be expanded to study the impact of feedstock options, equipment needs, and product costs of total bioenergy systems on a regional basis. Laboratory-scale R&D will investigate linkages among fuels development, power production, chemical products manufacturing, and agricultural and forest feedstocks and traditional products. Targeted, small-scale demonstrations will focus on enhancing current technology and planned facilities designs to emphasize multiple feedstock utilization and multiple products.

Within my own office at DOE, our primary mission is developing environmentally-sustainable energy resources and technologies, and finding ways to use energy more efficiently. Our current organization of bioenergy-related programs emphasizes technology development along three pathways: electric power, biofuels-primarily ethanol-and industrial biochemical products. Each program area is making significant progress, in partnership with industry, in technology development and demonstration. For example, we have developed effective methods for converting forest and agricultural residues and dedicated energy crops into cellulosic ethanol, and we are now providing limited, but crucial, financial support to first-generation, commercial-scale demonstration plants. We have just begun a program to develop small-size, modular biomass processing facilities-taking the processing and conversion to the resources, and greatly reducing transportation costs. Additionally, we have developed, in partnership with industry, technically viable methods of producing biomass gas for power generation. We are now testing a pilot scale gasification system at a commercial electric utility plant, with plans underway to support commercial scale demonstrations in the pulp and paper industry. We have also recently funded work to produce ethanol from residues in existing ethanol plants. In the area of industrial

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chemicals, our new program has just selected our first six R&D projects on Industry's technology roadmaps.

However, in order to reach the goal of tripling bioenergy use by 2010, we now must stretch beyond these niche sectors to realize the vastly greater potential for effective resource use that lies in full integration of the industry as a whole. This goal requires a cross-cutting approach to technology development and a recognition of the bioenergy industry as a dynamic, interdependent system. To that end, our Bioenergy Initiative focuses on collaborative planning and resource allocations by DOE headquarters programs, national labs, universities and our industry partners. In fiscal year 2000, Congress has appropriated as much as $8 million to directly support the Initiative, in addition to the DOE core budget of about $114 million that supports ongoing programs in biopower, biofuels, biochemicals, and forest products.

Within DOE more broadly, the Office of Science-which funds fundamental plant sciences through its Division of Energy Biosciences-is now an active participant in our Bioenergy Initiative team, and we are devising ways to incorporate its research into our applied technology efforts. We are also discussing with several of our DOE national laboratories, for example, the National Renewable Energy Laboratory and the Oak Ridge National Laboratory, the establishment of a National Bioenergy Center. The Center would be a "virtual" lab whose primary functions would be to provide administrative and logistical organization, information and technology sharing, and interactive communications capabilities. It would be the strategic umbrella for project consortia of national, state, university, and private sector researchers and organizations performing integrated bioenergy R&D through competitive solicitations.

The reason I have reviewed these developments is to point out that the Administration has recognized, and is beginning to address in concrete ways, the need for a cross-cutting, integrated systems approach to the very complex challenges-and wide range of benefits-of nurturing a bioenergy industry. The support of this Committee - and both our appropriations committees- is absolutely essential if we are to make serious headway over the next few years in setting the stage for rapid, wholesale advances in optimizing the utilization of our nation's biomass resources reaching the goal of tripling U.S. bioenergy use by 2010.

H.R. 2827-A First Step

Representative Ewing's bill, the National Sustainable Fuels and Chemicals Act of 1999 (H.R. 2827), is an important first step in providing the legislative underpinning for, and direction to, our efforts. The bill's findings make a compelling case for the need, the benefits, and the urgency of taking actions to stimulate bioenergy production and use. Substantively, the principal aims of Representative Ewing's bill appear to be:

- to spur closer coordination and cooperation between the USDA and DOE in strategic planning, in use of Federal research facilities, and in selection of R&D activities; to that end, the bill authorizes creation of both a Federal policy and oversight board and a non-Federal technical advisory board.
- to establish a mutli-agency, focused program of R&D activities whose objective is a more concerted, faster pace of development of agricultural and forest biomass feedstocks and their processing into power, fuels, and chemicals; and
- to authorize additional Federal resources for competitively-based financial support to a broad spectrum of research entities, preferably in consortia, targeted at: (a) biomass conversion; (b) biomass products development; and (c) sustainability and economic viability of both feedstocks and biobased products.

We view this bill as a valuable and complementary legislative foundation for those activities DOE and the administration have begun to plan and implement—with industry—to promote bioenergy integration. Both will increase the coordination between DOE, USDA, and other agencies in developing strategic plans and establishing R&D priorities and subsequent activities with the objective being to accelerate the pace at which feedstocks are developed and processed. Both H.R. 2827 and the Executive Order create interagency groups that will bring together the prominent Federal agencies and departments that are focusing on bioenergy and biobased programs as well as industry advisory groups to provide input and advise to the interagency group. The entities established by the Executive Order should be closely coordinated with the entities created by H.R. 2827.

I would like to point out where we believe some changes could improve the bill. First, the title-The National Sustainable Fuels and Chemicals Act of 1999-does not give sufficient recognition to the role of biomass power, or to the tremendous benefits in better air quality and lower greenhouse emissions that will be achieved as electric power producers introduce biomass into their fuel supplies, whether as co-

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fired material along with coal, or as biomass gas supplied to turbine units. As electric utility restructuring proceeds nationally, we expect to see many utilities facing the choice of what types of facilities to build, what types of equipment to install, and what types of fuel to use for generation. We would like to see more emphasis in this bill on biomass resource and technology development aimed at encouraging these utilities to move toward biomass power. This would not only be a great boon to biomass feedstock producers, primarily farmers and foresters, but is also a natural complement to an integrated biorefinery concept in which the lignin in biomass is fully utilized as a part of the multi-product mix of a biorefinery. Therefore, we would like to see the bill's title include the term "power," or alternatively, in line with the Executive Order, The Biobased Products and Bioenergy Act of 1999.

Another change we would hope to see is a less prescriptive approach to collaboration between USDA and DOE, and among the several other Federal agencies mentioned. Given periodic changes in internal agency organizations and senior personnel, as well as changes to mission roles within agencies, we feel that the designation of "points of contact" and their precise duties would be more effectively left to executive directives by the President and/or the Cabinet Secretaries rather than be enacted into law.

In the section dealing with "Uses of Grants, Contracts, and Financial Assistance," we would prefer again to see language that is somewhat less prescriptive. At the least, we would prefer greater latitude for the agencies in selecting which fields of R&D are to be emphasized. We feel that, over time, results of R&D and/or changes in market economics may lead to emphasis on priorities-or even new areas of research-that are not reflected in the bill. R&D priorities, we believe, can best be set by scientists and technologists who are closest to the moving targets at any given time. Specific R&D objectives written into law could prove cumbersome and awkward to change, especially in light of the possibility of unexpected breakthroughs or dead-ends in the research process. As mentioned above, we also want to be sure that any organizational structures created under Federal legislation are consistent with and build from the entities created under Executive Order 13134.

Overall, however, I want to thank the Subcommittee for having taken a first important step to address a real and looming need in the form of bioenergy R&D integration, across science and technology boundaries, Federal bureaucracies, and the public-private sector divide. This piece of legislation, if enacted, will be a visible boost to the widespread and valuable benefits of bioenergy.

Mr. Chairman, before I conclude my statement, I want to mention, H.R. 2819, the Biomass Research and Development Act of 1999, introduced by Congressman Mark Udall. Mr. Udall's approach differs from your bill but shares a common goal to enhance and improve the Nation's use of biomass for fuels and industrial processes. We look forward to working with this and other committee's as you craft legislation in support of this tremendous resource.

I look forward to working with the subcommittee, as the bills move through the legislative process, to see that they continue to reflect the priorities that the subcommittee and the administration have mutually agreed upon. We also anticipate working closely with you in the near future on legislative approaches that will address needs fundamental to the growth of an integrated bioenergy industry in the areas of policy and regulatory matters, tax credits and financing options, land-use policies, and industry-government partnership to tackle non-R&D issues.

Mr. Chairman, thank you for the opportunity to testify. I will be happy to answer any questions you may have.

TESTIMONY OF MIKE YOST ON BEHALF OF TONY ANDERSON

Good morning. I am Tony Anderson, a soybean and corn farmer from Ohio and first vice-president of the American Soybean Association (ASA). On behalf of ASA, I would like to thank the subcommittee for holding this hearing and especially thank you Mr. Ewing for your leadership in this area.

For years, soybeans have been called the miracle crop because they can be used for so many things. Of course, its most prominent use is a source of protein in both feed for animals and food for people. However, the soybean itself and its two major components, oil and protein, have many industrial uses.

Soybean producers across the country have invested millions of dollars of funds through the national and state check-off programs in developing and promoting soybeans and soy-based products. A portion of those funds has been directed at industrial uses. Many years ago, producers realized that soybeans were not only a valuable commodity but also a very versatile one. With a very competitive world market,

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soybean growers have realized we need to expand the utilization of soybeans and soy products beyond traditional uses.

Mr. Chairman, I know that you are aware of this investment and have been supportive of many of our initiatives. During the last session of Congress, you and several other members of this Subcommittee were original co-sponsors of legislation to promote the use of biodiesel and biodiesel blends in Federal markets. We thank you for your support.

As a direct result of last year's legislation, USDA has announced that the agency will purchase and use 20,000 gallons of biodiesel, and in fact, the Agriculture Research Service (ARS) lab in Beltsville, Maryland, began using B20 (20 percent biodiesel) in 65 vehicles last August. Officials at the facility tell us that things are running great.

I am personally proud to point out that Governor Bob Taft of my home state has announced that Ohio will use 400,000 gallons of biodiesel over the next year. As you can see by these two significant commitments to use biodiesel, we are finally starting to see some progress in this infant industry. Of course, we are far behind our friends in Europe who have encouraged the development and use of bioenergy, including biodiesel for many years. The result of the EU's investment is a viable bioenergy and efficient industry.

Our association hopes legislation like yours and its companion bill in the Senate will help focus attention and resources to the further development of technology needed to advance the use of biodiesel in the United States. We are concerned that without this support, biodiesel will continue to be plagued by policies that hinder rather than encourage its use.

Biodiesel and also soy ink are presently the most visible and commercially successful soy-based industrial products. However, they are by no means the only two available in the market place. Also available for commercial purchase and use are soy-based lubricants, adhesives, plastics, particle boards, detergents, solvents, and the list goes on and on. However, these products just like soy ink and biodiesel, need assistance in development and commercialization. While there is certainly a private investment in all of these products, there also needs to be a public investment by the Federal Government.

These products are usually more environmentally friendly than their petroleum-based competitors; they are derived from renewable resources; they help provide new markets for commodities such as soybeans which in turn helps farmers and the economy of rural communities.

However, the technologies are new and emerging and are often expensive. As soybean growers have learned with biodiesel, having a good product is sometimes not enough. Production and marketing are costly and complicated. More study and data is needed to help streamline processes to help get products into the marketplace in a timely and competitive manner.

The Federal Government can help provide both the financial resources and the expertise needed to bring products to the market. Just as an example of the need for more Federal assistance. Last year the DOE budget for biodiesel research, through the National Renewable Energy Laboratory, was only $750,000 and the USDA biodiesel research budget, through the Agriculture Research Service, was less than $1 million. In comparison, soybean growers have invested over $20 million farmer dollars over the last 6 years on biodiesel research and development.

Soybean growers and to a lesser extent the biodiesel commercial industry are providing the largest share of investment in biodiesel. However, there is a need for public research.We hope your legislation will serve as a catalyst for encouraging Federal investment not only in biodiesel but in all industrial products.

The Sustainable Fuels and Chemicals Board established in your legislation will a build a stronger partnership between Federal agencies that will improve communication and coordination. Presently, many agencies are not even aware of how they can contribute to the development and procurement of biobased products. The board can help focus all relevant agencies on this agenda and hopefully become the clearinghouse for information and available Federal resources.

We also applaud your decision to including authorization of an ethanol research pilot plant. We would like to see the Subcommittee also consider including authorization for a biodiesel project aimed at reducing costs of soy-based biodiesel.

Mr. Chairman as a soybean producer yourself, I know you are aware that soybean acreage is up and prices are down. There is little hope on the horizon to suggest that this trend will change in the near future. If we are going to impact the immediate success of soybean producers, now is the time for the investment in new markets and new uses of soybeans and soy preducts.

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Again, the members of the American Soybean Association commend you Mr. Chairman for your continued support. You are a true friend to soybean growers and we appreciate your leadership.

I will be happy to answer questions at the appropriate time. Thank you.

STATEMENT OF PAUL DESROCHERS

Chairman Ewing, Representative Gary Condit and committee members.

I appreciate the opportunity to come before this subcommittee to discuss the issues facing existing biomass to electricity conversion facilities. My name is Paul Desrochers, and I am the director of Biomass Fuel Procurement for Thermo Ecotek. Our company operates biomass to energy facilities in California, New Hampshire and Maine.

In California, our facilities are located in the vast agricultural region of the State, the Central Valley, which generates the majority of our biomass fuels.

A biomass to electricity power plant converts waste biomass fuels to electricity, through controlled combustion, utilizing state of the art emission controls. In fact our facilities are rated BACT, Best Available Control Technology.

The biomass industry in California, started in the mid to late 1980's, with the passage of PURPA and State mandated Power Purchase Agreements with the utilities. These contracts provided a "safe haven" economically for 10 years, after which energy prices were projected to increase sufficiently to allow transition to market rates and pay for the collection and processing of agricultural waste fuel.

The deregulation of the electric industry and current market prices of energy have made it difficult to operate these facilities, utilizing the same fuel mix. "Price-only" competition, unreasonably fails to attribute fair value to the demonstrable, non-electric benefits enjoyed by the public as an inherent component of this technology.

One of the facilities I represent, is Delano Energy Company, a 50 mw biomass to energy plant located in Delano, CA (30 miles north of Bakersfield). This is the largest biomass power plant in California, generating pow&for approximately 45,000 homes.

Delano is located in the heart of almond, walnut and citrus orchards, and our facility currently consumes large quantities of orchard removals and prunings. If this facility was not operating or accepting this biomass fuel, these trees would be burned in the open, further deteriorating the air quality in the Central Valley.

The San Joaquin Valley Air District is currently designated "Serious Non-Attainment" for PM 10, and "Non-Attainment" for ozone. By combusting orchard derived fuels, Delano Energy removes 5,500 tons of pollutants annually, valued in excess of $7,000,000.

The dilemma facing facilities like Delano, is that current market rates for energy are so low that the environmental benefits are in jeopardy.

Most renewable technologies like the biomass industry are working hard to transition, however it will be a challenge to compete with larger gas fired power plants on energy alone.

The key to successfully retaining these non-electric benefits of biomass to energy facilities is to assist the transitioning of facilities like Delano to be able to compete in an open market.

If not, we should expect the following to happen:

1. Erosion of biomass to energy production capacity.
2. A halt to technological innovation.
3. Loss of support from investment community.
4. Loss of technical and management talent.
5. Loss of the substantial environmental and economic benefits including high levels of rural employment provided.

Recently, much has been said and proposed to expand the biomass industry. It is important to realize, that the infrastructure to collect and process wood wastes for the biomass to power industry, is the same that would support new end uses of biomass.

I am here to support your efforts to pass legislation that could help the biomass to energy industry continue to provide significant environmental benefits. We would welcome the opportunity to develop a demonstration project that would:

1. Confirm the environmental benefits of biomass to energy in the Central Valley of California.
2. Assist the development of technologies that can help facilities like Delano Energy compete in a deregulated market.

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October 20, 1999

THE HONORABLE TOM EWING
Chairman, Subcommittee on Risk Management,
Research and Specialty Crops
U.S. House of Representatives

DEAR MR. CHAIRMAN:

Thank you once again for the work you and your subcommittee staff did to hold a hearing on H.R. 2827, the National Sustainable Fuels and Chemicals Act, and biomass research. During the hearing, Dan W. Reicher, Assistant Secretary for Energy Efficiency and Renewable Energy at the Department of Energy, testified about the potential of livestock and poultry waste utilization in biomass endeavors. Mr. Reicher offered an accounting of current biomass research projects utilizing livestock and poultry waste. Accordingly, I am writing to secure answers to the following questions, along with the request that the information be entered into the record:

1. What current projects are being funded by DOE, USDA, or other Federal and state governmental agencies in the area of biomass utilization of livestock and poultry waste? What is the current status of each of the projects?
2. What are the current scientific and economic gaps in utilizing livestock and poultry waste? What are the research needs?
3. Have the water quality benefits of using livestock and poultry waste as biomass been investigated? What are the watershed implications of using livestock and poultry waste as biomass?
4. How does USDA's authority in H.R. 2827 to build a pilot ethanol production plant interact with the authority USDA was given in section 404(c) of the research bill Congress enacted in 1998? Has USDA received an appropriation to carry out this section, and has interest been expressed in this authority?

I look forward to the response to these questions and to the subcommittee's continued focus on the promotion of biomass utilization.

Sincerely,

CHARLES W. STENHOLM
Ranking Minority Member

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